THE DIGGER WASPS OF NORTH AMERICA AND THE WEST INDIES BELONGING TO THE SUBFAMILY CHLORIONINÆ.

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INTRODUCTION.

The studies contained in this paper have been based upon the extensive collections of the United States National Museum, supplemented by the almost equally large collections of the American Entomological Society in Philadelphia. In addition to these the collections of the Museum of Comparative Zoology of Harvard University in Cambridge, the Carnegie Museum in Pittsburg, American Museum of Natural History in New York, and those of Cornell University, besides a large number of smaller collections from all parts of North and South America and the West Indies have been carefully examined, a total of several thousand specimens in all. All the types existing in this country, so far as known, have been studied, and detailed descriptions prepared directly from them, modified or added to by the study of other specimens of the same species.

All work on the Chlorioninæ must be based upon the admirable paper Die Hymenopterengruppe der Sphecinen, by Fr. Friedrich Kohl, published in Vienna in 1890. This magnificent work leaves little to be desired for the Chlorioninæ of the Old World, but for American forms it is hardly satisfactory, as Doctor Kohl was unable to see most of the American types, and their descriptions are usually quite inadequate. The result has been the redescription of many American forms and incomplete data of distribution for many more. Notwithstanding this, the present paper can hardly claim to be more than a supplement to the above-named work, intended to accomplish for American species what that paper has done for those of Europe and the East. Even the analytical keys are in many parts only modifications of Kohl's, and his kindly assistance has frequently been invoked and always granted.

So many persons have been of great assistance during the preparation of this paper that it would be impossible to mention them all, but

besides Doctor Kohl in Vienna, I am deeply indebted to Dr. R. Rathbun, assistant secretary of the Smithsonian Institution; and to Dr. L. O. Howard, of the U. S. Department of Agriculture; Dr. W. H. Ashmead, of the National Museum; to Dr. Henry Skinner, of the American Entomological Society, for the loan of material from the collection at Philadelphia; to Mr. Samuel Henshaw, of Harvard College; Mr. William Beutenmüller, of the American Museum of Natural History; Dr. W. J. Holland, of the Carnegie Museum; Prof. J. H. Comstock, of Cornell University; and Sir Daniel Morris, of Barbados, for the loan of material in their charge, besides nearly thirty other persons who have in a similar way aided me in bringing together for study the largest accumulation of insects of this group ever made in this country.

At the time the work was begun it was proposed to limit its scope to the United States. It soon became evident, however, that it would be necessary to include Mexico and the West Indies, and the discovery of species in Arizona not heretofore reported north of Venezuela has led to the study of Central and South American forms also. The intention in this paper now is to include all the Chlorioninæ known to occur in North America to the Isthmus of Panama and the West Indies, though the South American forms may perhaps be treated subsequently. It is the hope of the writer to be able to extend his studies to the Sceliphroninæ and to the Sphecinæ (Ammophilinæ of authors) though such study as he has given to this last group has shown that its present condition is anything but encouraging for systematic work.

CLASSIFICATION AND NOMENCLATURE.

For some years the classification of the wasps has been the subject of many differences of opinion, the term Sphegoidea, as used by Ashmead, having been considered by some writers as including a number of families, while others have regarded it as containing but one.

The main differences of these views may be found in Doctor Ashmead's paper,[a] so that it is unnecessary to consider them here. The studies of the writer, however, have led him to an opinion somewhat different from any of those there given so far as the value of the minor groups is concerned.

The different species included in this paper, for the most part, fall without difficulty into one or another of six groups recognized by Ashmead as genera. In some cases, however, species are met with which are intermediate in character, linking different groups together in such a way that it becomes difficult to characterize them without making many exceptions, though in any two of these there are forms which differ widely from each other. This is very suggestive of the idea that the individuals of an old genus are now beginning to diverge in different directions, and that the result will ultimately be the for-

[a] Canadian Entomologist, XXXI, p. 145 *et seq.*

mation of several new genera among the descendants of the original one. But while connecting links between these groups are still in existence it would hardly seem safe to rate these groups as full-fledged genera, and for the present they should be regarded as of only subgeneric rank. For this reason the groups termed genera by Ashmead are here regarded as subgenera included in the genus *Sphex*, the only genus of the subfamily Sphecinæ.

The genus *Sphex* was established by Linnæus in 1758, with twenty-five species. With the advance of entomological knowledge it soon became evident that many of these species had no close relationship, and they have gradually been withdrawn from *Sphex* and placed elsewhere. In fact this has been too well done, for at the end of the year 1805 not one of the original species of the genus was left, but instead an accumulation of other insects had been substituted, none of which had any right to be there according to the rules of nomenclature.

During the latter part of the eighteenth century, then, the genus *Sphex* was suffering from too much addition and subtraction, and the final result was that during almost the whole of the nineteenth century the name *Sphex* was applied to a group of insects not one of which was the same or even as much as congeneric with any of the species for which the genus was established.

From this it is evident that *Sphex*, as the name has been used during the last century, does not apply to the insects Linnæus intended—a condition in direct violation of that part of Rule 30 of the International Code of Zoological Nomenclature which says: "In no case, however, can the name of the original genus be transferred to a group containing none of the species originally included in the genus; nor can a species be selected as type which was not originally included in the genus." Consequently not only must the insects generally called *Sphex* during the past century give up this generic name, but some one of the original twenty-five described as *Sphex* must now resume it, together with all species with which it is congeneric.

In selecting the type of the genus *Sphex* as the next step which must follow we are no longer guided by any laws, but only by recommendations of the Code. As these represent a weighty consensus of opinion, however, it would seem desirable to follow them, if possible. The first and second recommendations under Rule 30 do not have any application in this case. The third directs, first, the exclusion from consideration of all species exotic from the standpoint of the author. This would leave eighteen species as possible types. The recommendation, then, is to reject "all species which have already been transferred to other genera. The type is then selected from the species which remain." In the present case, unfortunately, no species remain, all having been transferred to other genera; but if this method were to be applied and the last species (*pectinipes*) thus eliminated were to be

restored, the consequence would be that *Sphex* would replace *Tachysphex* as a genus of the Larridæ, and the terms Sphecinæ, Sphecidæ, and probably Sphegoidea as well would have to be abandoned.

As selection of the type by elimination would in the present case therefore produce great confusion not only in the group immediately concerned but in the Larridæ as well, it seems desirable to turn to the fourth recommendation of the Code, which is to "select as type the species which is best described, best figured, or best known." On this basis of selection only two of the species given by Linnæus in 1758 need consideration, namely, *sabulosa* and *spirifex*. Of these, the latter is omitted by Linnæus from his Fauna Suecica, indicating that his familiarity with it was not as great as with *sabulosa*, which is included in that work. That *sabulosa* is also in general the best known is indicated by the fact that in Dalla Torre's Catalogue there are 115 references to that species, and only 59 to *spirifex*. If page precedence be given any weight in the selection of the type, *sabulosa* should be chosen, as it precedes *spirifex;* while those who regard the first species of the genus as the type would here either have to make the type *argillacea* from Surinam, a species which has not since been recognized, thus removing *Sphex* as a generic name together with its subfamily and family compounds from use until *argillacea* is rediscovered, or, rejecting this, take the second species—*sabulosa* again—as the type.

Following the literature on *Sphex* down to the nineteenth century we find that almost every writer on the group recognized *sabulosa* as a *Sphex*, wherever he might place the other species, and that even after Kirby had placed it in *Ammophila*, in 1798, this change was only very slowly adopted, as a new group of species grew up around the genus *Sphex*.

For these reasons then, it seems best to regard *sabulosa* as the type of the genus *Sphex* and allow *Ammophila* to sink into synonomy together with the subfamily Ammophilinæ.

In this way the names *Sphex*, Sphecinæ, and Sphecidæ may be saved for use in this group though applying to a different subdivision, but the insects hitherto called *Sphex* must receive another name. For this purpose the oldest subgenus, *Chlorion*, first proposed as generic in value, may be raised again to that grade and also form the basis for the new subfamily name Chlorioninæ, which replaces the Sphecinæ in this place. A new name for the former subgenus *Sphex* is also needed, and for this (no synonyms existing) the writer[a] has proposed the term *Proterosphex* (from πρότερος older, σφήξ wasp) suggesting the name used for these insects during the last century.

[a] Entomological News, June, 1905.

The following tables, showing these changes, may be of assistance in this connection:

PRESENT ARRANGEMENT.

Family.	*Subfamilies.*	*Genera.*	*Subgenera.*
Sphecidæ	Sphecinæ.	Sphex.	Chlorion.
			Palmodes.
			Prionony x.
			Sphex.
			Isodontia.
	Sceliphroninæ.		
	Podiinæ.		
	Ammophilinæ.	Ammophila.	
		Psammophila.	

NEW ARRANGEMENT.

Family.	*Subfamilies.*	*Genera.*	*Subgenera.*
Sphecidæ	Chlorioninæ.	Chlorion.	Chlorion.
			Palmodes.
			Prionony x.
			Proterosphex
			Isodontia.
	Sceliphroninæ.		
	Podiinæ.		
	Sphecinæ.	Sphex.	
		Psammophila.	

The genitive of *Sphex* being *Sphecos* instead of *Sphegis* it follows that the subfamily and family names should be Sphecinæ and Sphecidæ, respectively.

GENERAL CHARACTERS.

The insects of the subfamily Chlorioninæ found in North America and the West Indies, are of moderate or small size, ranging from about half an inch to an inch and a half in length. Generally speaking, they have rather robust bodies, large wings, and long legs. The surface of the body is rarely entirely smooth. Usually the plates of which it is composed bear punctures, varying in size and in their nearness to each other. Closely correlated with the character of these punctures is the clothing of the body, and examination of the surface shows that the punctures are the places of origin of the hairs which form the clothing. The finest punctures are almost or quite microscopic, close together, and the hairs arising from them are exceedingly minute, short, decumbent, and give a sort of silky sheen to the surface. I have used the word "sericeous" to indicate this condition in the descriptive portion of this paper. Somewhat coarser punctures and correspondingly coarser hairs produce such an appearance as is found on the posterior side of the hind tibiæ throughout this group. Still slightly coarser punctures and a clothing which consists of short decumbent hairs placed close together constitutes the next step, and I have used the term "pubescent" to express this condition, which occurs

with some exceptions on the clypeus in these insects. Still coarser punctures are the places of origin of coarser hairs, or of hairs perhaps little coarser than those forming pubescence, but standing erect and not so close to each other but that the nature and color of the plate beneath can be seen. These hairs seem in most cases to reach their greatest size on the clypeus, particularly in *Proterosphex*, where they are almost bristles, erect, but with their outer portions bent downward. At different places on the body they vary in length and abundance, being longest usually behind the lower part of the eyes, and on the end and sides of the median segment.

Besides punctures, the surface of the body frequently shows parallel ridges or grooves, varying from fine to coarse. Whether they are ridges above the general surface of the plate or grooves in it, it is often difficult or impossible to determine. When in doubt the terms "striate," "striæ," or "rugose" have been used. Where these markings occur the punctures are usually in rows between them rather than on the ridges. Occasionally, particularly on the mandibles, elongated punctures resembling short grooves are found, either scattered or more or less in rows. These are termed "aciculations."

The colors present are limited, but the shades are numerous and perplexing. Black, ferruginous, and yellow are the leading colors, with every intermediate shade present in one or another species. The head and thorax are usually the location of the black, if present, while the abdomen may be partly black, partly ferruginous, entirely ferruginous, or even entirely yellow. The ferruginous is very variable in shade, ranging from a dark rich color resembling that of clear pieces of resin through lighter shades to a clear yellow. Where the thorax is black the legs and petiole tend to be black also, and in the case of the former when this fails the basal segments at least (coxæ, trochanters, and bases of the femora) are liable to be black, as are the tips of the claws, while the mandibles are usually black, though it is not unusual, particularly in species having more or less ferruginous on the body, to find a band of this color on the mandibles also.

The wings, frequently hyaline, sometimes have a yellow tinge, particularly on the basal half. The outer margin is often darker, as though somewhat smoky or fuliginous, and in many cases the entire wing is fuliginous, and may even be so densely so as to be nearly opaque. Accompanying this increase of the fuliginous is an increase in a reflection color seen at certain angles. In North American forms this is usually blue or violet, but in many South American species it is distinctly greenish.

Pubescence is generally yellow and often golden, almost metallic in its luster. If not yellow it is white, more or less silvery. A sericeous surface may be dull black, brown, gray, yellowish, whitish, etc., according to the color of the minute hairs causing it, and a covering of this nature often conceals the color of the chitinous plate beneath.

EXTERNAL ANATOMY.

Head.—The hypognathous head is large, broader than long, giving it a transverse oval or somewhat quadrangular outline when viewed from above. The compound eyes are large and extend from the top of the head almost to the base of the mandibles. Viewed from in front they form nearly half of the width of the head, while from the side they occupy a greater proportion, the cheek which lies behind the eye being at its widest place rarely more than half the width of the eye. The anterior and lateral margins of the eye are quite straight, but in *Proterosphex* this organ near the top extends toward the middle of the head somewhat, so that the two eyes are nearer each other at the vertex than a little lower down. In some species the two eyes converge somewhat below, particularly in the males, till their distance apart near the middle of the clypeus is less than on a line drawn through the posterior ocelli. (Plate VI, fig. 1.)

The clypeus occupies the lower portion of the front of the head between the compound eyes and extends upward nearly to the antennæ. Its form differs in the different subgenera, but is more or less triangular, the truncated apex being above. It is somewhat convex and extends to varying distances below the eyes in different species. The outline of its anterior edge also varies and is made use of in the determination of the subgenera. (Plate X, figs. 22–26.)

On each side of the clypeus is a wedge-shaped extension downward from the frons, separating the upper part of the clypeus from the compound eye. The dorsal edge of the clypeus is indicated by a transverse suture a short distance below the insertion of the antennæ. In some cases the lateral sutures are continued upward as grooves of the frons which converge and meet between the antennæ leaving a triangle above the truncated apex of the clypeus, which when the suture between it and the clypeus is not pronounced seems to be a part of the latter plate. From the junction of these two grooves between the antennæ a median groove (the frontal suture) extends toward the vertex to the median ocellus where it divides, a branch passing lateral to the ocellus on each side. Behind the ocelli a transverse groove connecting these branches is sometimes perceptible, thus inclosing the ocelli in a triangular area. Sometimes, also, traces of the frontal suture may be found behind the median ocellus and between and even behind the lateral ocelli.

The frons then may be regarded as extending upward from the clypeus to the ocelli, with a downward extension on each side of the former, and an upward extension on each side of the latter. Near the frontal suture, close together, and a short distance above the clypeus are the antennal insertions. The frons as a whole is usually sunken below the level of the eyes and clypeus, giving the front of the head as viewed from above a somewhat excavated appearance.

The ocelli are three in number, arranged to mark the corners of a triangle, the anterior and median being the larger of the three, while the others are posterior and lateral. The distance apart of the lateral ocelli as compared with that between one of them and the compound eye is often useful in the determination of species. Behind the ocellar triangle there is sometimes a transverse oval area slightly raised above the surrounding surface and perhaps marking the real vertex of the head. In this paper the vertex is considered as being on a line drawn through the posterior ocelli. No sutures separating the vertex from the posterior portion of the head above or from the cheeks at the sides behind the eyes are present, and the limits of these parts are therefore somewhat indefinite.

The portion of the head showing behind the compound eye is termed the cheek in this paper. Its width and fullness vary greatly. When full it gives to the head, as viewed from above, an almost quadrangular outline with rounded corners; when retreating the eyes also seem less full, giving to the head a more oval outline. The width of the cheeks is usually greatest a short distance below the top of the eye. Below this point they may narrow rapidly or remain quite broad for some distance, narrowing suddenly nearly at the level of the bases of the mandibles.

The labrum is attached to the lower inner edge of the clypeus, leaving the outer edge of the latter well defined. In preserved specimens it is usually bent backward nearly at right angles to the clypeus and with the mandibles closed together over it so that it is not accessible for study. For this reason it has not seemed best to make use of the characters it possesses for analytical purposes, though studies of its structure indicate that in some cases distinctive features may be found there.

None of the mouth parts save the mandibles seem to be useful for the determination of species and their description, therefore, it is not included here.

The mandibles vary considerably within the limits of the group. Ordinarily they are quite long, somewhat curved, stout and decidedly rapacious in appearance, each reaching the base of the other when the jaws are closed. The mandible may be considered as consisting of a shank, a terminal tooth, and one, two, or three teeth on the inner or upper face, these last being much shorter than the terminal one in most cases. The proportions of the teeth to each other vary greatly, however, not only in different species but even in the same individual at different ages, the digging, which the mandibles are used for, often wearing them down to mere stubs. The posterior face and under (outer) surface are smooth so far as teeth are concerned but particularly on the anterior surface grooves or rows of indentations, termed

here aciculations, are often present, and on the upper and lower (inner and outer) borders a row of quite long, stiff hairs is often seen.

The antennæ are quite long and are usually carried in a somewhat curled position. The basal portion or bulb of the proximal segment or scape is very small and articulates with the head in a socket. Its diameter at this end is about equal to its length to where it unites with the enlarged portion of the scape, but it narrows rapidly till, at the point where it enlarges into the scape proper, its diameter is but little more than half that at the base, the narrowing being mainly on one side. The bulb has every appearance of being an entire segment, but as this is not the generally accepted view it is here considered as a part of the scape. The scape is the stoutest portion of the antenna. It is often ferruginous or partly so, when the remainder of the antenna is entirely black. Smallest at its base it enlarges rapidly and suddenly constricts close to its articulation with the next segment, the pedicel, the increase in diameter, as in the case of the bulb, being chiefly on one side. It generally bears a number of hairs, most abundant internally, which may in some cases be even so coarse as to almost entitle them to be termed spines. The pedicel which articulates with the scape proximally and the first segment of the filament distally is a short, subglobular segment, sometimes differing with the scape in color, from the remainder of the antenna, though more frequently of the same color as the filament. It also frequently bears numerous small hairs most abundant on the inner face. Kohl appears to consider the pedicel as the first segment of the filament. The filament consists of ten segments in the females and eleven in the males. These segments are generally longest proximally, being there two or three times as long as broad, and the first one is usually the longest. The ends of the segments are slightly larger than elsewhere and the articulations are all somewhat oblique to the axis of the segments. The terminal segment at its tip appears almost as though cut off, the end being very abrupt. In the male there are two or three longitudinal ridges on each filament segment except the first and last (eleventh) with depressions between. At the outer end of each of the segments these ridges appear to be more or less joined to each other, so that any two would have somewhat the outline of the letter U. Traces of these ridges may also be found on the distal end of the first and basal part of the last filament segments. The surface of the filament, particularly its outer half or two-thirds, is frequently sericeous, caused by the presence of a dense layer of short, decumbent, very minute hairs which may give the surface a dull black, dull brown, or other color quite different from that of the chitin which always seems when unclothed to have somewhat of a luster. (Plate VIII, fig. 12.)

Prothorax.—The prothorax is naturally divided into two parts—the slender, more or less elongated portion which articulates with the

head, and which may be termed the neck, and the larger, posterior portion articulating with the mesothorax, which may be termed the collar. The neck joins the head at the center of a circular concavity of the latter, which permits a free movement of the head on the body.

The dorsal surface of the neck is rather flat; at its posterior end it suddenly broadens and unites with the anterior face of the collar, the two faces being nearly or quite at right angles to each other in some cases. On each side of the neck is a pronounced double suture extending backward, the sutures in the posterior half separating somewhat, leaving a narrow plate between them which may be pleural in its nature. Beneath, the neck is shorter, soon broadening and showing a median longitudinal groove. After thus widening it narrows, fitting like a wedge into the base of the collar, which enlarges, forming a pair of lobes to each of which a coxa is articulated.

The anterior face of the collar is quite high, rising nearly or occasionally quite to the height of the mesonotum. Above, it forms a rounded crest behind which the posterior face lies, often nearly parallel with the anterior one, its lower edge articulating with the anterior edge of the mesonotum. Sometimes the collar is closely appressed to the mesothorax; sometimes there is considerable space between them above. At the sides the surface of the collar is nearly vertical, rather triangular in outline and somewhat depressed near its middle, the vertex of the triangle being the edge of the crest already referred to. The width of the collar from front to rear varies in different subgenera, it being most compressed in *Proterosphex*, while in some of the other subgenera it is quite broad and its anterior surface is rounded vertically, thus making less than a right angle with the dorsal surface of the neck.

The lower back corner of the triangle forming the side of the collar is prolonged downward and backward and ends about opposite the middle of the posterior side of the fore coxa. From near the middle of the hinder margin of the side of the collar a lobe projects backward, coming in contact with the lateral margin of the mesonotum above, and overlying a depression of the mesopleuron in which a stigma is located and which it conceals. This lobe, called the "schulterbeule" by the Germans, I have termed the prothoracic lobe. Its outline varies somewhat in different subgenera. (Plate VI, figs. 1 and 2.)

Mesothorax.—The mesonotum is a broad plate lying between the fore wings and in front of them, extending to the hinder part of the collar anteriorly and to the prothoracic lobe at the sides. It is somewhat convex, and its sides and posterior edge are bent slightly upward or reflexed, forming a sort of flange varying in amount. Starting at the middle of the anterior margin and extending back one-third to one-half the length of the plate or even more, a groove is sometimes seen, varying in width, depth, and in the degree in which its edges are

developed, these last being sometimes very sharp and giving to the groove the appearance of a gutter. Occasionally a trace of a short lateral groove parallel with the central one may be seen lying a short distance from the base of the wing, and representing the parapsidal groove. Directly behind the mesonotum lies the scutellum, at the sides of which the hind wings are attached. This plate is much broader than long, convex, and with a more or less developed central elevation which is often partially divided into right and left halves by a weak central groove. As a general thing the central elevation is higher than the highest part of the mesonotum.

The mesothoracic pleuron is large and lies below the wing, its posterior edge being approximately indicated by an oblique groove extending downward and backward from beneath the wing nearly to the anterior side of the mesocoxa, where it ends at a swelling which apparently serves to prevent too great a dorsal flexure of this segment of the leg. Near the base of the fore coxa a groove is also present which passes from beneath upward through the pleuron somewhat behind the prothoracic lobe. This is known as the episternal groove, and it varies in amount of development in different species. Immediately around and behind the prothoracic lobe the mesopleuron is noticeably hollowed out as though for the accommodation of this lobe. There is no suture or other mark of separation between the pleuron and sternum, and no characters have been observed on the latter which are useful for the distinction of species except a short longitudinal incision about halfway from the median sternal suture to the angle where the surface curves upward to form the side of the body.

Metathorax.—The postscutellum, which lies immediately behind the scutellum, is a somewhat similar but narrower plate. Its anterior margin is nearly straight, but its posterior margin curves backward slightly, the plate having its greatest antero-posterior length in the middle. The central portion is the highest, though not as high as the scutellum, and like the latter it may have a slight median groove. The metapleuron has a small, rounded, swollen area or metapleural lobe near its middle dorsally, a little below the place of origin of the hind wing. This area is often pubescent when the remainder of the plate is not so, in which case it is very noticeable. The metapleuron narrows ventrally, its narrowest point being a little below the middle. Here it appears to turn and extend horizontally back to the base of the petiole, the sternum of the median segment not being visible. The lines or sutures separating it from the mesopleuron in front and the median segment behind disappear near the base of the mesocoxa, and the dorsal line separating its lower part from the pleuron of the median segment above is very faint or may even be absent. The real limits of the pleura of the meso- and metathorax and of the median segment can, indeed, be hardly regarded as having been finally settled,

and those here given are likely to be modified by more careful study of the development of these insects. It is certain that the limits here indicated are most unsatisfactory to the writer. As in the mesothorax no dividing line between the pleuron and sternum is visible, and the latter plate has no distinctive features of value.

Abdomen.—The median segment or propodeum is really the first segment of the abdomen, which has assumed close connection with the thorax and has often been considered as one of the segments of that division. It is followed by a remarkably slender, constricted portion of the second abdominal segment, termed the petiole, at the hinder end of which the plates of the segment suddenly enlarge to average size. The first segment of the abdomen then is closely joined to the thorax and separated from the greater part of the abdomen by the constricted petiolar part of the second segment. This misleading appearance should be kept in mind in any morphological considerations, but as a matter of convenience in this paper the petiole together with its enlarged posterior end is counted as the first abdominal segment.

The median segment lies between the metathorax and the petiole, and is more or less completely fused with the former. Its dorsal surface or dorsum lies immediately posterior to the postscutellum and extends backward more or less horizontally for some distance to where the outline of the body bends ventrally toward the petiole. At this point there is a depression or fovea of the chitin on the median line, which varies in outline in different species. In some cases it is decidedly crescentic, the concavity of the crescent being dorsal, while in other cases it is nearly circular in outline. The depth of the fovea also varies, being much greater in some cases than in others. On each side of the median segment, nearly on the line of the attachment of the wings and about halfway from the front to the rear of the dorsum is a stigma—the stigma of the median segment. A more or less well-developed line joins the upper end of the stigma with the fovea on the one hand and with the side of the anterior edge of the dorsum at the postscutellum on the other, these lines taken together limiting the dorsum and giving to it a somewhat shield-shaped outline when viewed from above, the form varying somewhat in different species according as the direction of these lines varies.

In many of the Chlorioninæ a groove extends forward from the side of the petiole, passing a short distance above the base of the metacoxa, where it is interrupted by a small swelling serving to check too great an upward movement of the coxa, and curving upward till it unites with the ventral end of the stigma of the median segment. This groove is known as the stigmatal groove. The portion of the median segment between the fovea and the petiole, and extending as far to each side as this groove, may for convenience be designated as the posterior end of the segment. (Plate VI, fig. 1.)

About halfway or a little less from the metacoxa to the stigma a faint horizontal ridge or line may be seen, extending forward till it joins the posterior metapleural suture or line, often at the bottom of a small depression. In forms where the stigmatal line is absent this line may sometimes be traced backward to the petiole, its course being a little above where the stigmatal groove would be in that region if it were present. This line between the stigmatal groove and the posterior metapleural line may be regarded as marking the line of separation between the lower part of the metapleuron and the pleuron of the median segment, which would lie dorsal to this line, anterior to the stigmatal groove, posterior to the vertical part of the metapleuron, and below the front part of the dorsum of the median segment.

The petiole is cylindrical, very slender, varying in length, and may either be straight or curved, the arch of the curve when this occurs being downward. At its base above is a small levator muscle or funiculus which is quite noticeable. Measurements of the length of the petiole are often difficult to obtain, as the posterior end of the median segment is frequently densely covered with long hair. The measurements of the petiole used in this paper are for this reason taken from the posterior end of the levator muscle to the point on the dorsal surface where the abdomen begins to enlarge and turn dorsally.

The part of the abdomen behind the petiole is more or less ovate in form, most pointed at the tip in the females, in which sex six segments are perceptible. The dorsal plate of the first segment rises sharply from the petiole, the angle varying, the plate being nearly or quite perpendicular to the petiole in some cases. The stigmata of this plate may lie in front, in the middle, or behind the middle of the plate, a character useful in subgeneric determinations. The other segments, except the sixth (terminal) usually have no structural features of importance in the female. The ventral plate of the terminal segment in this sex is frequently longer than the dorsal one, and just above its tip the sting may be protruded. In other cases the two plates extend an equal distance. The outline of the posterior edge in these plates varies and is a useful systematic character, as are also groups of hairs on the ventral plates of these segments. The sixth ventral segment is frequently quite strongly arched laterally, and in *Pulmodes* it is even compressed, so as to give a median longitudinal ridge which forms an edge between the two sides of this plate.

In the male the abdomen is less pointed behind than in the female and is more or less curled downward near its tip. Seven segments are perceptible on its upper side, and eight beneath. The first four dorsal plates are quite large and are wider from front to rear than the others. The outline of the posterior edges of the hinder dorsal plates, particularly of the last, is of importance. Beneath, the first four plates are also larger than the others, the fifth, sixth, and seventh being much

more narrow and liable to be flat or even somewhat hollowed inward. The form of the eighth (terminal) plate is usually more or less triangular and the outline of its posterior edge is of systematic value. Tufts of hairs are frequently present at the sides of the hinder plates beneath, and in *Isodontia* rows of stiff hairs along the posterior margins of these plates are characteristic of the subgenus. In some species the fourth and fifth ventral segments each have a median area densely sericeous in nature and usually of a dark color. The genitalia of the male often protrude somewhat between the last dorsal and ventral plates and in some species are so large as to show their structure quite well even when drawn in as far as possible.

Wings.—The wings are quite large, and, though sometimes hyaline, are usually more or less colored, either in part or entirely, as already described. It has seemed best in this paper to follow the nomenclature of the veins and cells used by Cresson and others, but drawings have been included which name the parts according to the Comstock system, these having been obtained through the kind assistance of A. D. MacGillivray, of Cornell University. (Plate VII, fig. 8; Plate VIII, fig. 10.)

Fore wings.—The radial cell is elongated, rounded at its outer end. Separating it from the costal cell is a well-developed stigma. Three closed cubital cells are present, except in cases of abnormal venation, lying between the costal cell, the stigma and the radial cell in front, and the first and third discoidal and second apical cells behind, the vein between these last and the cubital cells being the cubital vein. Of the three closed cubital cells the first is much the largest. The second and third vary in size according to the position of the transverse cubital veins which separate them. In some subgenera the first and second transverse cubital veins, which run approximately parallel, are so near each other that the second cubital cell is much longer between the radial and the two discoidal cells than it is in the other direction, a condition usually expressed as "higher than broad." In *Proterosphex* this cell has about the same diameter in each direction, while in *Isodontia* the breadth tends to be noticeably greater than the height. The third cubital cell is roughly triangular in form, the third transverse cubital vein passing at first obliquely outward and forward from the cubital vein, then bending inward and joining the radial vein not far from where the second transverse cubital vein unites with the latter. Two of the three cells immediately behind the cubitals are closed and are termed the "first and third discoidal cells," while toward the tip of the wing from the last named is the unclosed second apical cell, which lies posterior to the outer portion of the third cubital cell. Separating the two (first and third) discoidal cells and the second apical cell are two recurrent veins, the first of which arises posteriorly from the anterior outer angle of the second discoidal cell, which lies posterior to the first discoidal cell, the second recurrent vein arising from the

subdiscoidal vein. The places where these recurrent veins unite with the cubital vein vary as regards the cubital cells, not only in different species but in different individuals of the same species. As a general rule the first recurrent vein joins the cubital opposite some part of the second cubital cell, though it sometimes unites with the cubital directly opposite the junction of this with the second transverse cubital, in which case it is spoken of as being interstitial with the latter vein. Similarly the second recurrent vein usually joins the cubital somewhere on the inner half of the third cubital cell, though in *Sphex* (*Ammophila* Authors) and *Sceliphron*, belonging to the other subfamilies of the Sphecidæ, it unites with the cubital vein behind the second cubital cell. The distance apart on the cubital vein of the second transverse cubital and second recurrent veins as compared with the distance apart of the second and third transverse cubitals on the radial vein is frequently a useful comparison in diagnosis.

The outer part of the wing is free from closed cells, but the cubital and subdiscoidal veins extend into this portion somewhat, partially separating the fourth cubital, second apical, and first apical cells. The amount of development of these veins beyond the closed cells differs in different species. (Plate VII, fig. 7, and Plate VIII, fig. 9.)

Along the outer portion of the hinder margin of the wing, on the anal cell, is a fold known as the frenal fold, in which the frenal hooks of the hind wing catch, so that the two wings may act together.

Hind wings.—The more important features of the venation of the hind wings are as follows: The radial vein varies somewhat in the angle it makes in bending toward the apex just after leaving the costa. The path of the transverse cubital vein also varies, it in some cases being a nearly straight cross vein between the radial and cubital, while in others it curves so as to practically unite the last-named veins in a regular curve. Sometimes the portion of the cubital vein outside the transverse cubital is developed to a greater or less degree, more often only a dark shade is present in that place, and sometimes there is almost no trace of it present. The discoidal vein may have the cubital either external to the junction of the median, cubital, and transverse median veins or at their junction. The angle between the transverse median and the median veins (whether less, equal to, or more than a right angle measured internally) and the amount of curvature of the former are sometimes of some distinctive value, as is also the presence and amount of a slight backward curve near the middle of the cubital vein. The posterior lobe of the wing which extends from the base to the sinus is well developed and an axillary vein besides two folds are present.

Tegulæ.—The tegula is a small chitinous plate lying over the base of the fore wing and separating it from the side of the mesothorax. It is somewhat arched, frequently with slightly reflexed edges, and is often somewhat sericeous or pubescent, particularly near the middle.

Legs.—The legs are long but not very stout, the coxæ, trochanters, and femora unarmed with spines, but generally more or less hairy and frequently sericeous, sometimes even pubescent. The tibiæ are provided with spines on the sides and at the ends; the metatarsus is similarly armed and the other tarsal segments are spiny beneath and at their tips, but not above.

The fore coxæ are large and their basal articulations with the body are close together. Each is conical or subconical in form, the trochanter articulating at the apex. The trochanter is well developed, larger distally, and at its outer end joins the femur, which is smaller at this articulation than elsewhere. The fore femur is the shortest of the femora, but is quite stout and frequently bears a row of well-developed hairs along its under surface. The fore tibia is the only tibial segment of either of the legs, which is much shorter than the femur. It enlarges gradually toward its tip and bears rather short, stout spines on its sides, which sometimes show a partial arrangement in longitudinal rows. At the tip of the tibia are several spines, two of which are larger than the others, besides a long, curved, much modified spine bearing fine hairs on its inner surface, which, in connection with a corresponding modification at the base of the first tarsal segment (metatarsus), acts as a cleaning apparatus. (Plate IX, fig. 21.)

There are five tarsal segments: The first is much longer than the next three, and considerably longer than the fifth, and is called the metatarsus. This segment, in addition to short, irregularly distributed spines, has a row of them on the inner side and a similar one on the outer side. In the females a second row of much longer ones, called a "tarsal comb," is also present on the outer side of the metatarsus, the spines of the two rows alternating more or less regularly with each other except at the distal end of the segment, where two or three of the longer set are usually the only ones present. This row of long spines appears to be utilized in digging the holes in which the eggs of the insects and the food are placed, hence is absent in the males and in the subgenus *Isodontia*, which makes use of cavities in stems of plants and similar places as its breeding places. (Plate X, fig. 27.)

At the tip of the last tarsal segment is a pair of well-developed, curved claws, between which is a large pulvillus. On the inner (under) side of the claw, between its base and the middle, are from one to five or even six teeth. These may be pointed or blunt, well-developed or more or less rudimentary, and their number is useful in connection with other characters in determining the subgenera.

The middle coxæ are somewhat more widely separated at their articulations with the body than the fore coxæ. The femora and tibiæ are of nearly equal length, the latter being a very little the shorter. Aside from these differences and the absence of a cleaning apparatus at the tip of the tibia the mesothoracic legs differ little from those of the prothorax.

The articulations of the hind coxæ with the body are close together and at the very posterior end of the under surface of the thorax, the coxæ projecting distinctly backward. The tibia is slightly longer than the femur and its hinder surface is coarsely sericeous, almost pubescent. In some cases the inner side of the hind tibia is suddenly swollen near the end, though the segment usually only gradually increases its diameter in going out from the body. At the end of the tibia are two long spines, one of which has been modified to form a cleaning apparatus. The outer edge of this spine is nearly straight, but its inner edge for the third of its length nearest the tibia rapidly increases and apparently is formed by very closely set hairs. The rest of the inner edge bears a row of stiff hairs or teeth, longest near the middle. The differences in the structure of this inner edge are useful in subgeneric determinations. The hind metatarsus is usually straight. In one case (*Proterosphex tepanicum* Saussure), however, it is noticeably curved near its base. The tarsus as a whole is like those of the other legs. (Plate VI, figs. 3, 4.)

Sexual distinctions.—Aside from the presence of a sting in the females and of more or less evident copulatory organs in the males, many differences may frequently be noticed in the two sexes. In the females the antennæ are composed of 12 segments while in the males 13 are present, and show several longitudinal ridges, as already described. The inner margins of the eyes generally converge downward in the males. The outline of the anterior edge of the clypeus is more strongly developed, a tarsal comb is absent, the outline of the hinder end of the abdomen is less pointed than in the females and more abdominal plates are present and are of a different form, the clothing of the body is generally more developed and in the species here treated the male is smaller than the female.

CLIMATIC VARIATION.

Variation in members of the Chlorioninæ in relation to climate is not very marked. Certainly the more highly colored forms are from the tropical and subtropical regions, while black is more prevalent in northern examples, but no striking differences in this regard are noticeable. In a general way, however, it may be said that in species showing varying amounts of black and ferruginous the black covers more of the surface and that the ferruginous is less rich and strong in northern than in southern specimens. Pubescence in amount and in richness of color has also the same characters. In northern examples there is less of it and it is usually rather pale, while in insects from the Southern States, Mexico, and the West Indies it becomes more abundant, often forming a dense covering for almost the entire body except the abdomen, and its color is much deeper and richer. In one or two cases colors other than those usual to the group appear, as in

Proterosphex tepanicum Saussure, in which the greater part of the first three dorsal abdominal plates has a distinct reddish, almost purplish, shade, and as in the case of *P. latreillii* Lepeletier of Chili (extra-limital to this paper), where the thoracic pubescence is almost crimson. All such cases of departure from what may be termed typical colors seem to occur in tropical or subtropical regions, never in the cooler ones.

ANALYTICAL KEYS.

An excellent table of the families of the Sphegoidea is given by Doctor Ashmead,[a] and those who wish to place Sphegoidea in their families should consult that table. There follows below a table of the subfamilies of the Sphecidæ, which is practically only a somewhat rearranged copy of the one by Doctor Ashmead:[b]

ANALYTICAL KEY TO SUBFAMILIES.

1. Second cubital cell receiving only the first recurrent vein; the second recurrent vein received by the third cubital cell, or at least beyond the second transverse cubital. (Both recurrent veins are received by the first cubital cell in a few extra-limital forms) ..... 2.

   Second cubital cell receiving both recurrent veins, or the second recurrent vein is interstitial *with* the second transverse cubitus, although sometimes the first recurrent is interstitial with the first transverse cubitus, or then received by the first cubital cell ..... 3.

2. Antennæ inserted on the middle of the face; claws with one to six teeth beneath; tibiæ *strongly spinous*, or at least never with weak or feeble spines; tarsal comb in female present (except in *Isodontia*) ...CHLORIONINÆ (SPHECINÆ Authors).

   Antennæ inserted far anterior to the middle of the face; claws simple, without teeth, or at most with a single small tooth near the middle; tibiæ *smooth*, not spinous; tarsal comb in female never present .....PODIINÆ.

3. Claws simple, *without* a tooth beneath; tibiæ more or less spinous; tarsal comb in female present; abdomen most frequently very elongate, the petiole composed of *2 segments*, rarely of only *1 segment;* cubital vein of hind wings usually originating beyond the transverse median vein.

   SPHECINÆ (AMMOPHILINÆ Authors).

   Claws with a single tooth beneath, although sometimes very minute; more rarely without a tooth, the claws simple; tarsal comb in female absent; abdomen always with a one-segmented petiole; cubital vein of hind wings interstitial or nearly so ..... 4.

4. Antennæ inserted on the middle of the face; metathorax with a large U-shaped area above; mesopleura not longer than the height of the thorax.

   SCELIPHRONINÆ.

   Antennæ inserted far anterior to the middle of the face, *on* or just above an imaginary line drawn from base of eyes; metathorax *without* a large U-shaped area above; mesopleura much longer than the height of the thorax..PODIINÆ.

As, according to the views of the writer, there is but one genus—*Chlorion*—in the subfamily Chlorioninæ the table above leads not only to the Chlorioninæ but also to the genus *Chlorion*.

[a] Canadian Entomologist, XXXI, p. 152. [b] Idem, p. 348.

KEY TO THE SUBGENERA AND SPECIES OF THE GENUS CHLORION.

1. Second cubital cell of fore wing higher than broad ..... 2.
   Second cubital cell of fore wing as broad or broader than high, rectangular, or rhomboidal ..... 17.
2. Claws with one tooth ..... (Subgenus *Chlorion*) 3.
   Claws with two or more teeth ..... 4.
3. Body bright blue or green ..... *Chlorion cyaneum* Dahlbom (p. 313).
   Body bronze blue ..... *Chlorion cyaneum xvarium* Patton (p. 317).
4. Claws with two teeth; clypeus with a median truncated lobe and a sinus on each side ..... (Subgenus *Palmodes*) 5.
   Claws with three to six teeth; clypeus without a median truncated lobe but often with a median emargination or notch ..... (Subgenus *Priononyx*) 8.
5. Abdomen black or at most only faintly brownish or ferruginous.
   Palmodes laeviventris (Cresson) (p. 318).
   Abdomen more or less ferruginous or yellow ..... 6.
6. Abdomen entirely ferruginous or yellow ..... 7.
   Tip of abdomen black ..... *Palmodes abdominalis* (Cresson) (p. 322).
7. Wings yellow; female with seven comb teeth. *Palmodes praestans* (Kohl) (p. 328).
   Wings ferruginous; female with six comb teeth.
   Palmodes rufiventris (Cresson) (p. 325).
8. Females ..... 9.
   Males ..... 13.
9. Clypeus slightly rounded anteriorly, with no median emargination or notch.
   Priononyx ferrugineum (Fox) (p. 331).
   Clypeus with a median emargination or notch ..... 10.
10. Abdomen black or dark brown ..... *Priononyx atratum* (Lepeletier) (p. 338).
    Abdomen more or less ferruginous or yellow ..... 11.
11. Mesonotum rugose ..... *Priononyx striatum* (Smith) (p. 335).
    Mesonotum not rugose ..... 12.
12. Prothoracic lobe pubescent (not always sufficient to separate from the next ..... *Priononyx thomæ* (Fabricius) (p. 342).
    Prothoracic lobe not pubescent (not always sufficient to separate from the last) ..... *Priononyx biforcolatum* (Taschenberg) (p. 346).
13. Clypeus slightly rounded anteriorly, with no median emargination or notch ..... *Priononyx ferrugineum* (Fox) (p. 331).
    Clypeus with a median emargination or notch ..... 14.
14. Ventral plate of sixth abdominal segment broadly excavated on its posterior margin ..... *Priononyx biforcolatum* (Taschenberg) (p. 346).
    Ventral plate of sixth abdominal segment not thus excavated ..... 15.
15. Mesonotum noticeably rugose ..... *Priononyx striatum* (Smith) (p. 335).
    Mesonotum not noticeably rugose ..... 16.
16. Abdomen at least partly ferruginous ..... *Priononyx thomæ* (Fabricius) (p. 342).
    Abdomen black or dark brown ..... *Priononyx atratum* (Lepeletier) (p. 338).
17. Stigmatal groove rudimentary or absent ..... 18.
    Stigmatal groove present ..... (Subgenus *Proterosphex*) 29.
18. Third cell not broader on the radial vein than the distance between the second tranverse cubital and second recurrent veins on the cubital vein.
    Proterosphex lucae (Saussure) (p. 365).
    Third cubital cell broader on the radial vein ..... (Subgenus *Isodontia*) 19.
19. Mandible with two teeth (anterior tooth sometimes partly divided) ..... 20.
    Mandible with three teeth ..... 27.
20. Petiole black ..... 21.
    Petiole more or less ferruginous or yellow ..... 26.

21. Without golden thoracic pubescence. ..... 22.
With golden thoracic pubescence ..... *Isodontia costipennis* (Spinola) (p. 351).
22. First segment of antennal filament longer than fifth or sixth ..... 23.
First segment of antennal filament shorter than fifth or sixth ..... 24.
23. Median segment without long white hairs above.
Isodontia aztecum, female, (Saussure) (p. 353).
Median segment with many long white hairs above.
Isodontia aztecum cinereum, female, (H. Fernald) (p. 356).
24. Body hairs gray ..... 25.
Body hairs black ..... *Isodontia aztecum* var., male, (Saussure) (p. 356).
25. Front part of wings fuliginous ..... *Isodontia aztecum*, male, (Saussure) (p. 354).
Wings entirely fuliginous ..... *Isodontia aztecum* var., male, (Saussure) (p. 356).
26. Wings dark fuliginous ..... *Isodontia exornatum* (H. Fernald) (p. 350).
Wings yellowish: at most only somewhat fuliginous.
Isodontia costipennis (Spinola) (p. 351).
27. Legs black ..... *Isodontia harrisi* H. Fernald (p. 359).
Legs more or less yellowish ..... 28.
28. Abdomen black ..... *Isodontia auripes* H. Fernald (p. 356).
Abdomen more or less yellowish ..... *Isodontia elegans* (Smith) (p. 361).
29. Females ..... 30.
Males ..... 49.
30. Hind tibiæ suddenly thickened at the end on the inner side.
Proterosphex cubensis H. Fernald (p. 367).
Hind tibiæ not suddenly thickened ..... 31.
31. Abdomen more or less red or reddish yellow 32
Abdomen black (one exception) 40
32. Legs black 33
Legs more or less red or rusty yellow 34
33. Abdomen partly black; pubescence pale straw to silvery white.
Proterosphex texanum (Cresson) (p. 414).
Abdomen entirely reddish; pubescence golden yellow.
Proterosphex lautum (Cresson) (p. 371).
34. Anal segment red; some of the abdominal segments black.
Proterosphex dubitatum (Cresson) (p. 394).
Anal segment red or black; when red the other abdominal segments are also red ..... 35.
35. None of the abdominal segments black ..... 36.
Hinder abdominal segments black; petiole black ..... 39.
36. Petiole black ..... *Proterosphex resinipes* H. Fernald (p. 386).
Petiole red, orange, or yellow ..... 37.
37. Hairs on dorsum of median segment gray.
Proterosphex ashmeadi, new species (p. 389).
Hairs on dorsum of median segment not gray ..... 38.
38. Wings hyaline, with a yellow tinge.
Proterosphex ichneumoneum auriflavum (Perty) (p. 403).
Wings more or less fuliginous.
Proterosphex ichneumoneum fulviventris (Guerin) (p. 403).
39. Femora red (rarely black near base); a pubescent band along the stigmatal groove ..... *Proterosphex ichneumoneum* (Linnæus) (p. 399).
Femora black (sometimes red at tip); no pubescent band along the stigmatal groove ..... *Proterosphex maximiliani* (Kohl) (p. 397).
40. Legs partly rust red or rust yellow ..... 41.
Legs black ..... 46.

41. With a small pubescent spot above the middle and hind coxæ.
Proterosphex brasilianum (Saussure) (p. 412).
Without these pubescent spots ..... 42.
42. With pubescence on thorax and median segment ..... 43.
Without such pubescence ..... *Proterosphex bridwelli* (H. Fernald) (p. 384).
43. Tibiæ and tarsi rusty yellow ..... 44.
Tip of hind tibiæ and the hind tarsi black.
Proterosphex flavitarsis iheringii (Kohl) (p. 381).
44. Wings fuliginous with violet reflection.
Proterosphex flavitarsis H. Fernald (p. 379).
Wings not fuliginous ..... 45.
45. Wings with a distinct yellow tinge.
Proterosphex flavitarsis saussurei H. Fernald (p. 381).
Wings pale, without a yellow tinge.
Proterosphex flavitarsis guatemalensis (Cameron) (p. 381).
46. Longer body hairs black ..... 47.
Longer body hairs not black ..... 48.
47. Wings rusty yellow or yellowish brown.
Proterosphex caliginosum (Erichson) (p. 403).
Wings deep fuliginous, with violet reflection.
Proterosphex pensylvanicum (Linnæus) (p. 405).
48. Pubescence golden yellow ..... *Proterosphex habenum* (Say) (p. 374).
Pubescence pale yellow or nickel in color.
Proterosphex brasilianum (Saussure) (p. 412).
Pubescence dull white ..... *Proterosphex mandibularis* (Cresson) (p. 410).
49. Hind tibiæ suddenly thickened at the end on the inner side.
Proterosphex cubensis H. Fernald (p. 367).
Hind tibiæ not suddenly thickened ..... 50.
50. Hind metatarsus distinctly curved its entire length.
Proterosphex tepanecum (Saussure) (p. 377).
Hind metatarsus not noticeably curved ..... 51.
51. Hind edge of last dorsal abdominal segment above, truncated ..... 52.
Hind edge not truncated (with a central emargination or notch in some cases). 55.
52. Tibiæ and tarsi rusty yellow ..... 53.
Tip of hind tibia and entire hind tarsus black.
Proterosphex flavitarsis iheringii (Kohl) (p. 381).
53. Wings fuliginous with violet reflection. *Proterosphex flavitarsis* H. Fernald (p. 379).
Wings not fuliginous ..... 54.
54. Wings with a distinct golden tinge.
Proterosphex flavitarsis saussurei H. Fernald (p. 381).
Wings pale, without a yellow tinge.
Proterosphex flavitarsis guatemalensis (Cameron) (p. 381).
55. Seventh ventral abdominal plate with a central spine (sometimes hidden under the sixth plate) ..... *Proterosphex spiniger* (Kohl) (p. 392).
Seventh ventral abdominal plate without a spine ..... 56.
56. Legs partly or wholly rust red or rust yellow ..... 57.
Legs black ..... 64.
57. Abdomen more or less red or yellow ..... 60.
Abdomen black ..... 58.
58. Wings nearly hyaline; hind tibiæ (and tarsi except terminal segment) yellow or red ..... 59.
Wings strongly fuliginous; hind legs entirely black.
Proterosphex beatum (Cameron) (p. 411).

59. Wings with weak yellow reflection; pubescence abundant, golden or coppery.
Proterosphex brasilianum (Saussure) (p. 412).
Wings without yellow reflection; pubescence pale yellowish, very sparse.
Proterosphex nudum (H. Fernald) (p. 382).
60. Pubescent band present on metapleuron along stigmatal groove ..... 61.
Without such a band ..... 63.
61. Abdomen entirely red ..... 62.
Hinder segments of abdomen black. *Proterosphex ichneumoneum* (Linnæus) (p. 399).
62. Wings more or less fuliginous.
Proterosphex ichneumoneum fulviventris (Guerin) (p. 403).
Wings quite hyaline, with a weak yellow tinge.
Proterosphex ichneumoneum auriflavum (Perty) (p. 403).
63. With golden or coppery pubescence .. *Proterosphex maximiliani* (Kohl) (p. 397).
Pubescence silvery; usually almost entirely absent.
Proterosphex ashmeadi, new species (p. 389).
64. Abdomen black ..... 66.
Abdomen in part or wholly red ..... 65.
65. Pubescence golden, abundant ..... *Proterosphex lautum* (Cresson) (p. 371).
Pubescence silvery white ..... *Proterosphex texanum* (Cresson) (p. 414).
66. Longer hairs of thorax gray ..... 67.
Longer hairs of thorax wholly black ..... 68.
67. Wings quite fuliginous, with bluish or violet reflection; cubital vein of hind wing well developed beyond transverse cubital.
Proterosphex chichimecum (Saussure) (p. 407).
Wings nearly hyaline; cubital vein almost wanting beyond the transverse cubital.
Proterosphex texanum (Cresson) (p. 414).
68. Wings yellow ..... *Proterosphex caliginosum* (Erichson) (p. 403).
Wings deep fuliginous with violet reflection.
Proterosphex pensylvanicum (Linnæus) (p. 405).

DESCRIPTIONS.

The lists of literature of these insects given by Kohl, and particularly by Dalla Torre,[a] are so full that it has not seemed necessary to give complete lists here. Accordingly only the more important older foreign references are given, though it has been my intention to make the American references and those published since Dalla Torre's list as complete as possible.

The characters given for the subgenera are correct for American forms, but would need modification if applied to certain Old World species.

Genus CHLORION Latreille

Chlorion Latreille, Hist. Nat. Crust. et Ins., III, 1802, p. 333.

Type.—Sphex lobatus Fabricius, Syst. Ent., 1775, p. 348.

This being the only genus of the Chlorioninæ, the description of the external anatomy already given will apply here and need not be repeated.

[a] Catalogus Hymenopterorum, VIII.

Subgenus CHLORION Latreille (genus): Kohl.

Chlorion Latreille, Hist. Nat. Crust. et Ins., III, 1802, p. 333.
Dryinus Fabricius, Syst. Piez., 1804, p. 200.
Pronaeus Latreille, Gen. Crust. et Ins., IV, 1809, p. 56.
Chlorion Kohl, Ann. natur. Hofmus. Wien, V, 1890, p. 112.

Type.—*Chlorion* (*Chlorion*) *lobatum* Fabricius, Syst. Ent., 1775, p. 348.

Second cubital cell of the fore wing much higher than broad. Claws with a single tooth near the middle of the inner edge. Anterior border of the clypeus with teeth. Median segment with a stigmatal groove. Stigma of the first dorsal abdominal plate placed in front of the middle. Tarsal comb of the female well developed. Body metallic, glistening. (Plate IX, fig. 13; Plate X, fig. 22.)

The genus *Chlorion* as established by Latreille does not in all respects agree in diagnosis with the type,[a] but as it was a monotypical genus, and only later had *compressa* added to it, and as the first reviser, Jurine, retained *lobatus* as the type and removed *compressa* to his new genus *Ampulex*, this "assignment is not subject to subsequent change."[b] Patton[c] also takes this view.

CHLORION (CHLORION) CYANEUM Dahlbom.

? || *Sphex cærulea* Linnæus, Syst. Nat., 12th ed., I, 1766, p. 941.
? || *Sphex cærulea* De Geer, Mem. Hist. Nat. Ins., III, 1773, p. 589, pl. xxx, fig. 6.
|| *Sphex cærulea* Drury, Ill. Nat. Hist. Ex. Ins., II, 1773, p. 75, pl. xxxix, fig. 8.
? *Sphex cyanea* Fabricius, Syst. Ent., 1775, p. 346.
? *Sphex cyanea* Fabricius, Ent. Syst., II, 1793, p. 201.
? *Pepsis cyanea* Fabricius, Syst. Piez., 1804, p. 211.
Chlorion cyaneum Dahlbom, Hym. Eur., I, 1843, p. 24.
Chlorion cyaneum Dahlbom, Hym. Eur., I, 1845, p. 435.
? *Sphex cærulea* Lepeletier, Hist. Nat. Ins. Hym., III, 1845, p. 336.
Chlorion cæruleum Walsh, Am. Ent., I, 1869, p. 164.
Chlorion cæruleum Riley, First Rept. U. S. Ent. Com., 1878, p. 319 (in part).
Chlorion cyaneum Packard, Guide to Study of Ins., 8th ed., 1883, p. 167.
Sphex cærulea Cameron, Biol. Centr.-Amer., Hym., II, 1888, p. 29.
Sphex (*Chlorion*) *nearcticus* Kohl, Ann. natur. Hofmus. Wien, V, 1890, p. 186.
Sphex (*Chlorion*) *occultus* Kohl, Ann. natur. Hofmus. Wien, V, 1890, p. 187.
Chlorion cæruleum Ashmead, Ins. Life, VII, 1894, p. 241.
Chlorion cæruleum Ashmead, Psyche, VII, 1894, p. 65.
Chlorion cæruleum Peckhams, Wisc. Geo. and Nat. Hist. Surv., Bull. 2, 1898, p. 173, pl. II, fig. 3; pl. XI, fig. 4.
Chlorion cyaneum H. Fernald, Ent. News, XV, 1904, p. 117.

Metallic blue, green, or greenish blue on the head and body; body rather slender for its length, generally somewhat blackish sericeous with minute punctures close together.

[a] See Westwood, Trans. Ent. Soc. Lond., III, 1841–1843, p. 227.
[b] International Code of Nomenclature, Art. 30.
[c] Proc. Bos. Soc. Nat. Hist., XX, 1880, p. 379.

Female.—Head broader than distance between outer edges of tegulæ, narrow from front to rear; clypeus less than half as long as wide, its middle elevated, forming a ridge narrowest behind, broadening anteriorly; posterior outline of clypeus somewhat emarginate near the middle of each side, extending below the eye to the base of the mandible; anterior edge blackish, with five blunt teeth, the lateral one farther from the three near the center than these are from each other (the number of these teeth is subject to individual variation, and I have seen one specimen with none); surface of clypeus rather sparsely, coarsely punctured, bearing black hairs, some near the anterior edge being quite long; least hairy near the posterior emarginations; frons with a more or less evident median elevation from the antennæ part way to the median ocellus, this region being quite closely, coarsely punctured and sometimes slightly rugose; surface of frons hollowed on each side of the elevation, most deeply so at the clypeus; above and between the antennæ the surface is slightly rugose; surface of frons more or less punctured, the punctures varying in size and abundance in different specimens; bearing numerous short, black hairs, best seen in profile; median ocellus largest; on the inner side of each lateral ocellus is a long, black hair (macrochæta) and nearer the occiput is a second pair farther apart; behind the ocelli is a faintly marked transverse oval elevated area at the ends of which the posterior pair of macrochætæ lie; surface of vertex and occiput with punctures varying in size and abundance; cheeks quite broad above, narrowing rapidly below; above with scattered punctures which become larger and closer below where there are numerous long, black hairs; a row of black hairs is present on the edge of the occiput; inner margins of the compound eyes converging above, parallel on their lower half; their lower edges nearly at right angles to their inner ones; antennæ; scape black, glistening somewhat, sometimes metallic like the body; remainder brownish sericeous; the scape has rather coarse punctures and numerous short, stout hairs except externally; first segment of filament longest, sometimes slightly swollen near its tip, which is surrounded by a number of minute, black hairs, also present on the second, and sometimes on the third and fourth segments; mandibles with two teeth, the terminal one forming half the length of the mandible; anterior tooth blunt; a ridge extends from the base outward and soon forks, a branch passing along each tooth; in the space behind each of these ridges the surface is somewhat aciculated; the anterior tooth and the ventral side of the mandible bear scattered black hairs; color of the mandibles black except for a dull ferruginous area near the junction of the teeth in some cases, and a slight ferruginous tinge near the edges.

Thorax.—Collar rather narrow, its sides and posterior face quite vertical, not closely appressed to the mesonotum; anterior face quite vertical below, rounded or sloping backward above; dorsal edge and

upper part of anterior face somewhat depressed in the middle, making the dorsal edge two-humped, the height of these humps varying considerably; neck transversely rugose, these marks varying in strength and frequently extending back onto the lower part of the collar, the surface of which is more or less punctured and bears short black hairs varying in size and abundance like the punctures; side of collar in front of prothoracic lobe sometimes faintly rugose vertically; prothoracic lobe generally quite closely, sometimes sparsely, punctured and with numerous, quite long, black hairs; its posterior edge with a dense fringe of short, pale hairs; prosternum and propleuron with a thickening at their edges, thus placing their suture between two ridges; this is also the case on the middle line of the prothorax beneath, thus dividing the prosternum (?) into right and left halves; sternal surface with numerous punctures and long, black hairs; sericeous; mesonotum sericeous, with punctures varying in abundance and size, and with short, black hairs; from the upper edge of the prothoracic lobe to the tegulæ, then back along the side of the plate, and partly across the hinder end, the edge of the mesonotum is upwardly reflexed; two short, faint, impressed lines are present on the middle anteriorly and a faint parapsidal groove is perceptible; scutellum without a median furrow, its central portion elevated to form a nearly flat, transverse, oval area bearing a few scattered, rather small punctures, sometimes very faint or absent; at the anterior lateral sides the plate is not depressed and is somewhat triangular there, the upper surface of this portion being smooth, while its outer side which faces outward is usually slightly rugose, as is also the posterior lateral face of the scutellum in most cases; postscutellum with a slight median impression, a slightly reflexed edge anteriorly, and in general minutely punctured and with a tendency to transverse aciculation; dorsum of median segment not pointed but evenly rounded behind to the fovea, which is a narrow, transverse depression; surface of dorsum transversely rugose, the ridges turning somewhat backward laterally, the rugosity coarsest in front, frequently nearly or quite obsolete behind; there is a distinct median depression on the dorsum, sometimes slight or absent anteriorly; the surface is usually bare, but sometimes bears very short, black hairs; stigmatal groove well developed; posterior end of median segment turning downward sharply from the dorsum, its surface coarsely rugose and punctured; in some cases the first ridge below the fovea is much higher than the others and sometimes near the dorsum at the sides the rugosity becomes almost obsolete; the surface is quite well provided with black hairs of medium length, which, near the stigmatal groove, are longer and more abundant and the ridges are coarser; mesopleura quite coarsely punctured, sometimes partly rugose, with scattered black hairs; mesosternum marked like the mesopleura and with a median suture; metapleura coarsely, obliquely rugose and with

numerous black hairs, longest and nearest together near the stigmatal groove; petiole straight, glistening, slightly longer than the first filament segment, finely punctured, and with numerous long, black hairs.

Abdomen.—Long, ovate, more pointed behind, rather rounded in front, glistening; above somewhat sericeous; stigmata of first segment oblique, in front of the middle; the segments show a few faint, scattered punctures, becoming closer and larger on the last three segments; on the first two of these there is a row of punctures parallel to and a little in front of the hinder margin, with a very few short, black hairs at the extreme side on the first of the two, but extending nearer the middle in the second; the terminal segment has more and longer hairs generally distributed over the surface; its hinder margin is bluntly acuminate and its sides somewhat emarginate near the tip; the margin is sometimes pale, and the entire segment is sometimes black and not metallic; beneath, glistening, sometimes sericeous, with scattered, minute punctures mainly toward the sides and on the front part of the plates in the center; the punctures increase in number and size on the hinder segments; short black hairs have the same distribution as above; last segment coarsely, quite closely, punctured, with a slight median ridge on its posterior portion (sometimes its whole length) and with a slightly thickened posterior margin acutely oval in outline; the front portion of the last segment (usually concealed) is slightly or not at all punctured and the segment may be black and not metallic.

Wings.—Dark fuliginous with violet reflection which is lost on the outer margins, these being rather velvety in appearance; fore wing; second cubital cell high and narrow, receiving the first recurrent vein before, at, or beyond the middle; third cubital cell nearly as long as the radial; external end of radial cell rounded; second transverse cubital vein not straight, bending into the second cubital cell; hind wing; discoidal vein interstitial with the median and transverse median veins, the latter two meeting at about right angles; cubital distinct beyond the transverse cubital (which is quite straight); radial vein external to the transverse cubital strongly arched. Tegulæ black, slightly sericeous in front, glistening; with scattered, minute punctures and a few short, black hairs; its posterior margin sometimes faintly dull ferruginous.

Legs.—Black, somewhat glistening; coxæ and trochanters black, metallic in some cases; femora stout, black, sometimes metallic, glistening, with scattered punctures and numerous quite long, black hairs, and somewhat sericeous in some lights; fore and middle tibiæ shorter than their femora, brownish; fore tibiæ light brownish sericeous on the inner face; fore tarsi brownish, light brownish sericeous beneath, with seven or eight (usually seven) comb teeth; claws almost ferru-

ginous; middle and hind tibiæ grayish sericeous; inner contour of hind tibiæ straight; spines of all the legs black.

Male.—Body and head rather more densely covered with hair and more closely punctured than in the female; clypeus usually with three blunt teeth in front; macrochætæ of ocellar and vertex regions absent or not usually to be distinguished from the other hairs; anterior face of collar as a rule more vertical than in the female; last dorsal abdominal plate evenly rounded, densely punctured, quite hairy, and with a pale hinder margin; second ventral abdominal plate quite smooth, with a few scattered punctures and black hairs; third, fourth, and fifth plates more abundantly punctured but chiefly at the sides and anterior to the middle; sixth plate quite evenly, but not coarsely punctured, slightly emarginate behind; seventh plate narrow, less emarginate than the preceding; eighth (terminal) plate rounded, with numerous punctures and brown hairs; with little or no metallic luster.

Length.—Females, 21–31 mm.; males, 19–24 mm.

CHLORION (CHLORION) CYANEUM ÆRARIUM Patton.

Chlorion ærarium Patton, Can. Ent., XI, 1879, p. 133.
Chlorion cæruleum var. *ærarium* Patton, Proc. Ent. Soc. Wash., III, 1896, p. 46.

Type.—One female, in the collection of the American Entomological Society at Philadelphia.

This subspecies is readily distinguished by its color, which is bronze blue or purplish blue, and by its somewhat more slender body and generally smaller size.

This beautiful species is widely distributed in North America, but I have no record of it from the West Indies. The typical form is distinctly southern, belonging to the Lower Austral Zone, though it is sometimes found in the southern portion of the Upper Austral, mingling there with *ærarium* which extends through this zone well up toward the Transition Zone, though it occasionally occurs much farther south, and specimens have been taken even in Florida and Texas in which the blue showed a bronze tint. In Texas, New Mexico, Colorado, and California a greenish shade often appears and may in some cases entirely replace the blue.

Kohl[a] finds two species among the specimens of this insect accessible to him and names them *nearcticus* and *occultus*. I am unable to separate these as some specimens show some characters of the one and other characters of the other. Apparently *nearcticus* applies to those forms in which the punctures and rugosity are least developed, while *occultus* is applied to those in which they are strongest; but with an excellent series of intermediates before me I can not regard the differences as marking more than extremes of individual variation.

[a] Ann. natur. Hofmus. Wien, V, 1890, pp. 186–187.

This species provisions its nests with crickets (and perhaps with grasshoppers also). References to its capturing spiders for this purpose are due to a confusion with the smaller *Sceliphron*.

Subgenus PALMODES Kohl.

Palmodes Kohl, Ann. natur. Hofmus. Wien, V, 1890, p. 112.
Palmodes Kohl, Ann. natur. Hofmus. Wien, XI, 1896, p. 318.

Type.—*Chlorion* (*Palmodes*) *occitanicum* Lepeletier and Serville, Ency. Meth., X, 1825, p. 462.

Second cubital cell of the fore wing much higher than broad. Claws with two blunt teeth near the base of the inner edge. Median segment without a stigmatal groove. Clypeus flat, with a median truncated elongation and a sinus at each side. Stigma of the first dorsal abdominal plate at or behind the middle. Tarsal comb of the female developed. Comb teeth of the outer part of the hind tibial spine thorn-like or tooth-like. Inner borders of the eyes parallel in the female, converging downward in the male. Last ventral abdominal plate of the female laterally compressed, almost forming a longitudinal edge in the middle. Ventral abdominal plates of the male flat, the fourth and fifth silky sericeous. Abdomen black, ferruginous, or yellow. (Plate IX, fig. 14; Plate X, fig. 23.)

CHLORION (PALMODES) LÆVIVENTRIS (Cresson.)

Sphex læviventris Cresson, Proc. Ent. Soc. Phila., IV, 1865, p. 463.
? *Harpactopus rufiventris* Patton, Bull. U. S. Geol. and Geogr. Surv., V, 1880, p. 354.
Sphex (*Palmodes*) *morio* Kohl, Ann. natur. Hofmus. Wien, V, 1890, p. 321.

Types.—Six female, ten male specimens, in the collection of the American Entomological Society in Philadelphia. Though sixteen specimens were studied when the description was prepared only one bears a label in Cresson's handwriting, and I am told that it was his custom to label but one and regard that as the type. At the present time four females and four males of this lot bear printed "type" labels.

Black, quite robust, without pubescence except on the front of the head; wings uniformly fuliginous; hairs black.

Female.—Head broad, quadrangular from above with rounded corners, very slightly excavated in front between the eyes; clypeus broad, somewhat arched near the middle, the sides flat; densely brownish black sericeous, and with numerous punctures and long, black hairs; its anterior margin bare, smooth, slightly reflexed, with a broad median truncated projection, at the side of which is a sinus beyond which the edge turns upward toward the eye, near which it again extends laterally to the base of the mandible below the eye; frons densely brownish black sericeous; in some cases, together with the clypeus, more or less silvery pubescent; with scattered punctures a

little finer than those on the clypeus, and with hairs somewhat shorter and finer; median suture plainly marked, forking in front of the median ocellus, the two branches continuing obliquely backward till behind the line of the lateral ocelli where they are united by a faint, backwardly arched, transverse suture or groove; traces of the median suture are also present between the lateral ocelli; below, and lateral to the median ocellus is a short, narrow, vertical depression, and behind, and lateral to each lateral ocellus is another smaller one, the four together marking the corners of a quadrangular area within which the ocelli are located; vertex marked like the frons; cheeks minutely punctured, and also with quite numerous larger punctures and long hairs, particularly below; antennæ black; scape minutely punctured and with scattered larger punctures and short, stiff hairs; pedicel the same; filament grayish sericeous in certain lights, its first segment longest; the first four segments of the filament show the following length relationships $\frac{1}{2.7}$, $\frac{2}{2.3}$, $\frac{3}{1.9}$, $\frac{4}{1.7}$ (average of several examples); mandible black, three toothed, robust, with a slight ferruginous band at the base of the teeth; somewhat punctured or aciculate, with a few long hairs on the under or posterior edge, and on the upper (inner) surface near the base.

Thorax.—Neck short; collar rather long, its hinder face vertical, not very high, not closely appressed against the mesonotum; anterior face evenly sloping, with a broad, rounded top, so that the dorsal edge is quite broad and evenly rounded from side to side, highest in the middle; surface blackish sericeous, with numerous coarse punctures and long black hairs; propleura very minutely, obliquely aciculate and with numerous fine punctures in rows; prosternum thickly, closely punctured, with many long hairs; prothoracic lobe rather sparsely covered with punctures of medium size and black hairs; posterior edge with quite a dense fringe of short, dull-brown hairs; mesonotum black sericeous, with numerous rather coarse punctures and long hairs; the anterior median groove shallow, narrow, smooth, without marked edges in front where it is broadest; lateral margin somewhat reflexed from above the prothoracic lobe to the scutellum; scutellum rather high, rounded, with a very faint median depression; surface with very minute punctures and numerous coarser ones and rather short hairs; postscutellum evenly rounded, without a median groove, rather finely and closely punctured, with hairs longer than those on the scutellum, and with traces of fine transverse aciculation; dorsum of medium segment rather finely, transversely aciculate, with a faint median depression, broadest behind and hardly reaching the anterior end; very finely punctured along the grooves and with a thick covering of short, erect, brownish hairs; dorsum bluntly acute at the fovea, which is subtriangular; posterior end of median segment coarsely punctured and with many long hairs; without aciculations in

the middle but quickly appearing toward the side; side of the median segment obliquely aciculate, more coarsely so anteriorly, the aciculations continued onto the metapleura; the sides are also coarsely punctured and with quite a thick clothing of long hairs; portion of mesopleuron next below the tegula rather coarsely, nearly horizontally aciculate; portion behind the prothoracic lobe very finely, almost vertically aciculate; the area next posterior to this with a faint trace of aciculation, the grooves running obliquely downward and forward; lower part of mesopleuron to the coxæ both minutely, closely, and also coarsely, more sparsely punctured; the whole mesopleuron covered with quite long hair; metapleuron everywhere more or less finely, obliquely aciculate, least evident above the coxæ; coarsely punctured and with long hairs; mesosternum with coarse punctures and long black hairs; petiole black, shorter than the posterior coxæ, straight, with rather fine punctures and medium long hairs.

Abdomen.—High, rising nearly vertically from the petiole, broad, ovate, most pointed behind; above; slightly sericeous in certain lights, with scattered punctures, mostly small, except on the last two segments, where they are coarser and closer together; terminal plate rather narrow, its posterior margin rounded oval in outline; beneath; first ventral plate smooth, glistening; ventral surface in general somewhat sericeous, with scattered fine and coarser punctures, mostly on the sides and toward the hinder margins of the plates; second and third plates broadly, slightly emarginate behind; fourth with a few short hairs at the sides; fifth with more hairs, narrower from side to side, its hinder margin with a broad, shallow notch; sixth with its sides rolled upward, showing from above, laterally quite compressed, almost forming an edge along the median line on the hinder four-fifths of its length; thickly, quite coarsely punctured, and with numerous, long, stout hairs.

Wings.—Uniformly fuliginous, a little lighter along the outer row of cells, darker just beyond this, then lighter to the margin; with a very faint, violet reflection; fore wings; radial cell bluntly rounded at the tip, scarcely extending beyond the third cubital; second cubital cell high, narrow, about equally wide top and bottom, the first transverse cubital vein bending into the first cubital cell somewhat; hind wing; transverse median vein making less than a right angle with the median, the discoidal veins being almost interstitial at this point; a faint trace only of the cubital vein beyond the transverse cubital; tegulæ black, sericeous in front, smooth behind, and dull ferruginous there in some lights; with a few short hairs.

Legs.—Coxæ black, sericeous in some lights, with numerous coarse punctures and long hairs; trochanters similar, the hairs less abundant; femora black, the front pair stoutest; all slightly sericeous in places, glistening, with scattered, coarse punctures and hairs of medium size;

the fore femora are slightly grooved beneath, near the tips; tibiæ shorter than the femora except the hinder pair which equal their femora in length; sericeous and with numerous rather short, stout spines; tarsi black with a very slight ferruginous tinge; sericeous; fore metatarsus with six or seven (usually six) comb teeth, long and stout; claws ferruginous, blackish at base, with two blunt teeth on the inner edge near the base; hind tibia and base of hind metatarsus strongly brown sericeous behind; hind tibial spine with separated, short, blunt teeth on its outer half; inner contour of hind tibia straight on the outer half but with an abrupt inward crook near the base, seen when the tibia is viewed from behind.

Male.—Differs from the female as follows: Mandible with two teeth; edge of clypeus with a less developed sinus; eyes converging downward; the four indentations near the ocelli very faint, particularly the upper pair; median groove of mesonotum with more pronounced edges; petiole longer than in the female, usually as long as the posterior coxæ, slightly shorter than the first and second filament segments together, but longer than the first and half the second; second and third ventral abdominal plates not emarginate behind; fourth and fifth brown, silky sericeous, the former somewhat emarginate behind, the latter with a slight, broad emargination; sixth and seventh narrow from side to side, the sixth broadly emarginate, the seventh almost broadly notched rather than excavate; terminal ventral plate very narrow, quadrangular, its hinder margin with a central notch on each side of which it is arcuate; the last two ventral plates nearly enveloped by the last dorsal plate, the hinder margin of which is rounded conical; hind tibiæ viewed from behind, with an abrupt inward crook near the base; outer borders of the wings lighter than the remainder.

Length.—Females, 19–28 mm.; males, 15–22 mm.

Some variations from the characters described above are met with in certain cases. There seems to be a tendency for portions of the first and second dorsal abdominal plates to show a faint tinge of brown or ferruginous; seven teeth in the metatarsal comb are not uncommon, and in one specimen seen there were seven on one side and six on the other; while pubescence on the face is generally absent, traces of it may often be noted; rarely the petiole is shorter than the hind coxæ.

Cresson's description is defective in that not all the males, even in the lot before him when his description was prepared, have a silvery clypeus, and the thorax is not really smooth as he stated, though it does have that appearance when not closely scrutinized.

Distribution.—I have seen specimens of this species from the Yakima River and the Grand Coulee, Washington; Crow Heart Butte, Wyoming; Missoula, and Flathead County, Montana; Ormsby County, and Reno, Nevada; from Dakota, Colorado, Nebraska, and Kansas; and

from Coronado, San Diego, Santa Barbara, and Los Angeles County, California. So far as these localities go, the insect seems to belong rather to the transition zone of the Rocky and Sierra and Nevada mountains, and to the more arid portions thereof.

Nothing of the habits of this insect appears to be known and it is not a very common species.

There are three male and two female specimens of a black *Chlorion* (*Palmodes*) in the collection of the American Entomological Society in Philadelphia, which I am unable to distinguish from this species in any way except by size, the males being only 12 mm. and the females 15 and 16 mm., respectively, in length. They were taken in Colorado and "W. T." Whether they are the same or a different species, I must leave for others to determine.

CHLORION (PALMODES) ABDOMINALIS (Cresson).

Sphex abdominalis CRESSON, male, Trans. Am. Ent. Soc., IV, 1872, p. 211.
Harpactopus abdominalis PECKHAMS, Wisc. Geol. and Nat. Hist. Surv., Bull. 2, 1898, p. 174, pl. II, fig. 1.

Type.—"One male found on sumach flowers in August. (Coll. G. W. Belfrage.)" This type is now in the National Museum at Washington. A specimen labeled in Cresson's handwriting is in the collection of the American Entomological Society at Philadelphia.

Female type (now first described) in the collection of the Massachusetts Agricultural College at Amherst, Massachusetts.

The following description was prepared from the type specimen.

Black, except the first two segments behind the petiole, and a small portion of the third, which are pale ferruginous; wings uniformly fuliginous; without pubescence; hairs everywhere black.

Male.—Head: rather broad; frons somewhat hollowed between the eyes; clypeus quite flat, very closely, minutely punctured and with numerous coarser punctures and long hairs; its anterior edge with a very slightly reflexed, smooth, narrow rim; frons closely, very minutely punctured, and also quite closely covered with coarser punctures, which are not as coarse as those of the clypeus; with numerous black hairs; frontal suture distinct and continuing behind the median ocellus to a transverse, backwardly-arched groove behind the lateral ocelli; this with two oblique grooves inclose the ocelli in a triangle; vertex, occiput, and cheeks with fine punctures and coarser ones, about like those of the frons, but becoming coarser on the lower part of the cheeks; hairs corresponding in size and abundance to the punctures; longest low down on the cheeks; inner margins of eyes converging toward the clypeus; cheeks at their widest part about half the width of the eye as seen from the side; antennæ; scape and pedicel glistening black, with a few short hairs, particularly toward the end of the scape, and a few very fine hairs on the pedicel; first filament segment

longest, somewhat grayish sericeous but less so than the remainder of the filament; second and third filament segments nearly equal in length, fourth and fifth shorter, nearly equal; mandibles black, somewhat tinged with ferruginous near the base of the two teeth; bearing a few black hairs on the posterior face near the base.

Thorax.—Collar robust, its posterior face vertical, evenly sloping in front, quite broad from front to rear over its crest, which is evenly rounded from side to side; its surface toward the crest brownish sericeous; surface closely, minutely punctured and also with numerous somewhat coarser punctures and rather short hairs; its side in front of the prothoracic lobe very finely aciculate, the grooves running obliquely forward and downward; prothoracic lobe with small, scattered punctures and rather long hairs; with a dense fringe of short, pale-brown hairs on the hinder border; mesonotum dark-brown sericeous; closely, minutely punctured and with a few somewhat coarser punctures and scattered, short, black hairs; with a narrow median groove extending nearly halfway back, with distinct edges, the groove being a little wider anteriorly; lateral margin reflexed slightly from near the prothoracic lobe up around the tegula and backward to the posterior margin, then inward till the scutellum rises to its level; scutellum higher in its middle than the mesonotum, rounded, with a distinct median groove; its surface closely, minutely punctured and with a few somewhat coarser punctures and a few short, fine hairs; postscutellum without median groove, finely, rather irregularly, transversely aciculate and with rather short hairs; dorsum of median segment finely, transversely aciculate, coarsest anteriorly, closely covered with very short, erect hairs; end of dorsum rounding to a rather blunt point at the fovea, which is small and subtriangular; a median shallow depression is present along the dorsum; hinder end and sides of the median segment rather finely aciculate, the grooves at the sides running obliquely downward and forward and continuing onto the metapleura; stigmatal groove absent; mesopleura rather more coarsely aciculate beneath the tegulæ than elsewhere, the grooves nearly horizontal; behind the prothoracic lobe more finely aciculate, the grooves running upward and backward; remainder to the middle coxæ closely, minutely punctured and with numerous rather coarse punctures and long hairs; metapleura obliquely aciculate everywhere except around the stigma, coarsest beneath the base of the hind wing; with numerous quite coarse punctures and long black hairs; mesosternum with a median groove; with numerous rather coarse punctures and long hairs; petiole black, slightly curved, about the length of the posterior coxæ, bearing many short, black hairs.

Abdomen.—First two segments ferruginous, the third slightly so on the sides and behind, above; remainder black; above; first segment rising quite sharply from the petiole, high; its stigma behind the

middle; third segment black except for a ferruginous tinge on its posterior edge and an encroachment of the same color from the preceding segment on its sides (the amount of ferruginous and its extent varies considerably in different specimens); fourth, fifth, and sixth dorsal plates with a tendency to a median carination; these plates very finely, closely punctured, besides a few coarser, scattered punctures; terminal plate tinged with brownish or ferruginous; narrow, evenly rounded behind; beneath; first ventral plate changing from black to pale ferruginous; second, third, and base of fourth pale ferruginous; remainder black; sixth and seventh thickly covered with short, dark hairs; last plate small, poorly preserved in the type; in other specimens narrow, with a median notch on the hinder margin, on each side of which the margin is arcuate; posterior margin of fourth and sixth plates broadly emarginate; the fourth and fifth black, silky sericeous.

Wings.—Uniformly fuliginous with a slight violet reflection; fore wing; third cubital cell nearly as long as the radial, which is rounded at its end and more than twice as long as wide; first transverse cubital vein bent slightly into the first cubital cell; second cubital cell high, narrow, its ends about equally wide; hind wing; transverse median vein leaving the median at about right angles to the latter but soon bending inward so that as a whole the two veins make less than a right angle with each other; discoidal not interstitial; cubital only slightly developed and for a very short distance beyond the transverse cubital; tegulæ black, somewhat ferruginous behind, slightly sericeous.

Legs.—Black, some parts tinged with ferruginous producing a dark, reddish-brown color; coxæ closely, minutely, and also coarsely punctured; with long black hairs; trochanters the same, except having fewer coarse punctures and hairs; the hinder pair not sericeous, and reddish brown; femora reddish brown, rather sparsely, minutely punctured and with a few coarser punctures and hairs; tibiæ closely, minutely punctured, sericeous in places in some lights, reddish brown; hind tibiæ as long as their femora; the others shorter; the hinder pair strongly brownish sericeous behind; hind tibial spur with coarse, blunt, spaced teeth on its outer half; tarsi dark brownish sericeous; claws blackish at base, ferruginous elsewhere.

Female.—Differs from the male as follows: Transverse groove behind the ocelli not well marked; mandibles with three teeth; cheeks somewhat broader than in the male; with six long, stout, blunt comb teeth on the fore metatarsus, the first one being often the least developed; tip of abdomen as in *rufiventris;* petiole a little longer than the second and half the third hind tarsal segments; nearly all of the third abdominal segment ferruginous.

The amount of ferruginous on the abdomen varies in different specimens, being much more in some than in others. Except for the presence of black, I can find no characters which will separate this

species from *rufiventris*, and it is not improbable that a larger series will show that the two are merely color varieties.

Length.—Females, 18–20 mm.; males, 14–17 mm.

This interesting species appears to be widely distributed but far from common. I have seen specimens from Texas, Florida, New Mexico, California, Georgia, Virginia, and New Jersey; from Ludlowville, New York; Michigan, Wisconsin, and Minnesota, and it is recorded from northwestern Illinois as well.

On so many of the specimens only the State is given that I find it impossible to make out any relation to the life zones for the distribution of the species.

CHLORION (PALMODES) RUFIVENTRIS (Cresson).

Sphex rufiventris Cresson, Trans. Am. Ent. Soc., IV, 1872, p. 211.
Harpactopus rufiventris Patton, female, Bull. U. S. Geol. and Geogr. Surv., V, 1880, p. 354.
Harpactopus rufiventris Patton, Proc. Bos. Soc. Nat. Hist., XX, 1880, p. 383.
Sphex rufiventris Coquillett, Rept. U. S. Dept. Agr., 1885, 1886, p. 299.

Types.—Two females, now in the collection of the National Museum at Washington. Cat. No. 1690, U.S.N.M.

Male type: One specimen from Texas, in the collection of the National Museum; now first described.

The following description, prepared from the types, is followed by comments obtained from the study of other specimens:

Body to and including the petiole, black; abdomen ferruginous; legs black; wings fuliginous.

Female.—Head rather large, quadrangular, hollowed in front between the eyes when viewed from above; clypeus short, broad, extending below the eye nearly half the width of the eye; its surface almost flat, the anterior margin very slightly reflexed, smooth; the remainder very closely, minutely punctured and with numerous coarser punctures and moderately long, black hairs; frons similarly marked, the coarser punctures not as coarse and nearer each other than on the clypeus; its surface almost without hairs (worn off?); frontal suture distinct; a short distance obliquely backward from each lateral ocellus there is often a puncture larger than its neighbors, showing best in worn specimens; surface of vertex marked like the frons, its highest point about opposite the hinder edge of the eyes; cheeks broad, nearly the width of the eye, broadest in the middle, minutely, closely punctured and also with coarser punctures, particularly below; with numerous long, black hairs, longest below; inner margins of eyes parallel; antennæ; scape black with a ferruginous tinge, somewhat glistening, with a few short, black hairs and two or three stout ones on the inner side at the tip; very minutely punctured; pedicel short, black; filament black, particularly toward the base, grayish sericeous in some

lights; its first segment about one and a half times the length of the second; third segment of the filament slightly shorter than the second, about one-fifth longer than the fourth; mandibles long, stout, blackish, streaked longitudinally with ferruginous, three-toothed, the middle tooth rather more slender than the anterior one; with a row of punctures from the base to the base of the anterior tooth and another along the ventral face, with a few black hairs on the posterior side.

Thorax.—Collar large, thick from front to rear, its anterior face not vertical, though about at right angles to the portion of the neck nearest; evenly rounded from side to side and somewhat appressed against the mesonotum; its surface blackish sericeous, closely, minutely punctured, and with a few somewhat coarser, scattered punctures; prothoracic lobe with a few, small, scattered punctures and a well developed, dense fringe of short, pale brown hairs on its posterior edge; near its base is a trace of aciculation, the grooves running downward and backward; this is more pronounced on the propleuron just in front, and on the mesopleuron just above the lobe and below the tegula, where the grooves run backward but only slightly downward; mesonotum very minutely punctured and also with a few coarser punctures and scattered, short hairs; its median groove about one-fifth as long as the plate itself, deep, narrow, sharp-edged; a faint line extending backward from it; lateral edges with a slightly reflexed rim from in front of the tegulæ backward, then inward to where the scutellum rises to the level of the mesonotum; scutellum rounded, higher than the mesonotum, with a median groove; its dorsal surface minutely punctured and with a few slightly coarser ones as well; at the sides behind, it is very finely, obliquely aciculate; postscutellum narrow, evenly rounded, finely, transversely aciculate; median segment dorsum forming a rounded point at the small, triangular fovea; its surface more coarsely, transversely aciculate than the plates anterior to it; a faint median depression is present near the middle and hinder end, but between these places it is still fainter, and in front there is no trace of it; the aciculation is coarsest in front; posterior end of median segment slightly, transversely aciculate, with numerous rather large punctures and long hairs; sides of median segment closely, rather finely aciculate and with numerous hairs of medium length; stigmatal groove absent and the aciculations continued directly onto the metapleura which are finely aciculate, the grooves running forward and downward; mesopleuron behind the prothoracic lobe very finely aciculate, the grooves running forward and downward; the lower portion to the mesocoxæ roughened, with a faint trace of nearly vertical aciculation and with numerous, short, black hairs; portion of metapleuron next the base of the hind wing more coarsely aciculate than elsewhere; mesosternum with a pronounced median longitudinal ridge, minutely, closely punctured and also with numerous coarse punctures and long hairs; petiole

black, sometimes with a slight ferruginous tinge, nearly straight, as long as the posterior coxæ, with a few scattered punctures and black hairs.

Abdomen.—Quite high above the petiole, elongate, pointed at both ends, rather sharply bent beneath between the first and second segments, yellow ferruginous varied with darker in places, glistening; above; stigma of first dorsal plate behind the middle; a few scattered punctures showing, more abundant posteriorly; fourth plate somewhat broadly emarginate behind; sixth plate rather long and narrow, rounded behind; with a very few short brown or black hairs at the sides; beneath; similar to above, but rather darker and somewhat more punctured; all the plates more or less emarginate behind; last plate laterally compressed, almost carinate medially, long, and with quite long, black hairs; the plate projecting beyond the dorsal plate.

Wings.—Uniformly fuliginous, with a slight yellowish tinge and a violet reflection; fore wing; radial cell broadly rounded at tip, extending no farther than the third cubital cell; first transverse cubital vein bent slightly into the first cubital cell; second cubital cell high, narrow; hind wing; transverse median vein making less than a right angle with the median, though leaving it at right angles; discoidal vein almost or quite interstitial; cubital vein almost obsolete beyond the transverse cubital; tegulæ black with a faint ferruginous tinge, slightly sericeous.

Legs.—Black, more or less tinged with dull ferruginous; coxæ closely, minutely, and also coarsely punctured; with numerous long hairs; trochanters similarly marked but the coarse punctures and hairs are less numerous and the latter are shorter; femora rather sparsely, minutely punctured and with a few coarser punctures and hairs; more distinctly tinged with ferruginous; tibiæ closely, finely punctured, sericeous in places in some lights; hind tibiæ as long as their femora; the others shorter; the hind tibiæ strongly brownish sericeous behind; hind tibial spur with coarse, blunt, spaced teeth on its outer half; fore metatarsi with six long, stout comb teeth; tarsi finely, closely punctured; claws with two teeth on the inner edge near the base; blackish at the base, ferruginous elsewhere; the outer tooth may be of either color.

Male.—Differs from the female as follows: Clypeus with the central lobe less produced; inner margins of the eyes slightly converging; frons, vertex, and cheeks with more of the coarser punctures; as a whole more brownish sericeous and more hairy; the next to the last ventral abdominal plate with a broad, shallow notch; its posterior third very closely, finely punctured and with coarser punctures mingled here and there with the others, and thickly covered with very short, dark hairs; terminal plate very slightly rounded behind, its surface punctured and with hairs like the posterior third of the plate in front;

last four dorsal abdominal plates showing more or less black, the two anterior ones somewhat mottled with ferruginous and somewhat sericeous.

Length.—Females, 16–23 mm.; male (only one seen), 19 mm.

This species like the last has a wide range, but is not at all common. I have seen specimens from Texas, California, Colorado, Kansas, and "Can."

The absence of black on the abdomen seems to be the only character which separates this species from *abdominalis* and in some cases the hinder part of the abdomen is much darker than in others though it could hardly be termed black. It is very probable that with a larger series the two species will prove to be the same, in which case the name *abdominalis* will hold by "priority of place."

The following species is also very closely related to this, and may prove to be only a variety of it:

CHLORION (PALMODES) PRÆSTANS (Kohl).

Sphex (*Palmodes*) *præstans* KOHL, Ann. natur. Hofmus. Wien, V, 1890, p. 323.

Type.—Described from one (?) specimen in the Hamburg Museum, taken in California.

Large, black except for the pale ferruginous, almost yellow, abdomen. Wings strongly tinged with yellow. Hairs black.

Female.—Head black, large, almost oblong when viewed from above, slightly excavate between the eyes; clypeus broad, slightly convex, its anterior margin with pronounced lateral sinuations and a large central, truncated lobe; the anterior margin reflexed and smooth; the remainder with numerous coarse punctures and long, stout, black hairs; frons excavated laterally, with an evident frontal suture; its surface with numerous rather coarse and many very minute punctures and quite long hairs; frontal suture continued behind the median ocellus to a slightly arched transverse groove; an oblique groove passes from the frontal suture to the end of the transverse groove on each side of the ocelli, thus inclosing the latter in a triangle; distance between the lateral ocelli about equal to that from the ocelli to the eye; vertex sparsely black pubescent, and with quite numerous, long hairs; cheeks quite wide above, narrowing rapidly below; with numerous long hairs; eyes parallel, not converging below; antennæ black, the filament grayish-sericeous; scape and pedicel dull, faint ferruginous beneath, the former with a few short, rather stout hairs; relative lengths of the filament segments $\frac{1}{3\,5}$, $\frac{2}{2\,4}$, $\frac{3}{2\,0}$, $\frac{4}{2\,0}$, mandible black, long, stout, three toothed, the middle tooth the smallest, with a groove from the base nearly to the middle tooth on the anterior face, from which arise a few hairs; a slight groove is also present near the ventral edge.

Thorax.—Neck rather short, quite stout, making nearly a right angle with the collar; collar broad, thick; its dorsal edge rounded both from

front to rear and laterally; its surface quite thickly, coarsely punctured and with many long black hairs; neck above faintly, transversely aciculate; sides of collar in front of the prothoracic lobe almost vertically aciculate behind, obliquely so in front; this portion with a nearly vertical, smooth, narrow ridge near its middle, opposite the lower half of the prothoracic lobe; prothoracic lobe with many minute and scattered, medium-sized punctures; with long, black hairs and a fringe of short, brownish ones on the posterior margin; propleura and prosternum similarly punctured; mesonotum with a reflexed edge from the prothoracic lobe back; with a median groove, narrow (almost an impressed line only) except near the front; surface of mesonotum with medium-sized punctures and many minute ones, with numerous hairs and sparse, black pubescence; scutellum rather rounded in the middle, not higher than the mesonotum, slightly and rather broadly depressed from front to rear along the middle line, with rather scattered punctures and a few hairs; postscutellum narrow, evenly rounded, without a median, impressed line or groove; with rather fine punctures and short hairs; dorsum of median segment rather coarsely, transversely aciculate, the aciculations continued over the sides and onto the metapleura; with a median depression, broader behind, near the fovea; posterior end forming a marked angle with the dorsum which in profile shows a fine, brownish, erect pubescence; posterior end rather more finely aciculate than the dorsum, covered with long hairs; sides of the median segment obliquely aciculate and punctured; metapleura and upper, posterior part of the mesopleura (under the hind wing) obliquely, coarsely aciculate and well clothed with long hairs; mesopleura closely, coarsely punctured and thickly clothed with hair; meso- and metasterna similarly clothed; petiole black, with a dull, ferruginous tinge, quite straight, curved a little at about its posterior third, sparsely punctured and with a few scattered hairs; as long as the second and half of the third hind tarsal segments together.

Abdomen.—Pale ferruginous yellow, glistening; rising sharply to a point high above the petiole; rounded in front, long pointed behind; above with a few minute, scattered punctures; last dorsal plate arched rather like a cap, its posterior margin rounded, compressed at the sides, with the punctures somewhat more abundant than in front; below; first ventral plate dark anteriorly, gradually becoming pale ferruginous; a trace of a transverse row of minute punctures in front of the hinder margin of each segment, with small, black hairs arising from them; fourth and fifth plates slightly emarginate behind; sixth plate laterally compressed, its tip narrowly rounded and with numerous long hairs near the middle, following around toward the lateral edges till they lie on the upper side of the body, close to the tip of the shorter dorsal plate.

Wings.—Hyaline, strongly tinged with yellow to beyond the ends of the cells; the outer margin of the fore wings slightly fuliginous; fore wing: outer end of radial cell broadly, quite evenly rounded; third cubital cell extending nearly to the end of the radial; the larger veins ferruginous, the smaller ones yellow; hind wing: transverse median vein somewhat curved, making as a whole less than a right angle with the median; discoidal vein not interstitial; cubital vein obsolete beyond the transverse cubital which passes obliquely forward and outward; tegulæ black with a faint ferruginous tinge; slightly black pubescent in front.

Legs. Black, with a faint ferruginous tinge, particularly toward the tips; fore coxæ large, with coarse, scattered punctures and long, black hairs; fore trochanters with a few such; fore femora short, stout, glistening; with a few black hairs; fore tibiæ with numerous short, stout, black spines and scattered punctures; fore metatarsus with seven quite long, stout, rather bluntly ending comb teeth alternating with shorter ones; on the underside is a band of minute, erect, very short, brown hairs; rest of the fore tarsus with many long, stout, blunt spines; these segments and the claws distinctly ferruginous; claws with two blunt teeth near the base on their inner margin; hind tibia longer than its femur; hind tibial spine with coarse, spaced teeth on its outer half.

Male.—Unknown.

Length.—Female, 21–25 mm.

This description was prepared from two specimens marked "Mt. Shasta dist. Califor." and now in the American Museum of Natural History in New York. A third specimen there, bearing the same locality label has only six comb teeth, somewhat fuliginous wings, a more decidedly ferruginous abdomen, a trace of a ferruginous band across the mandible, the radial cell more squarely ended, and with a trace of the cubital vein beyond the transverse cubital in the hind wing.

This rare species seems to be very limited in its distribution, so far as the few specimens now known go, it having been taken only in California and Beaver canyon, Utah (one specimen in the Brooklyn Museum). Whether it is a good species or only a marked variety of the last can hardly be determined without a larger series for study.

Subgenus PRIONONYX Dahlbom (genus).

Priononyx Dahlbom, Hym. Eur., I, 1845, p. 439.
Harpactopus Smith, Cat. Hym. Brit. Mus., IV, 1856, p. 264.
Gastrosphaeria A. Costa, Fauna Napoli. Sphecid., 1858, p. 10.
Harpactopus—Gastrosphaeria—Priononyx Kohl, Ann. natur. Hofmus. Wien, V, 1890, p. 113.
Harpactopus Kohl, Ann. natur. Hofmus. Wien, XI, 1896, p. 319.

Type.—*Chlorion* (*Priononyx*) *thomæ* Fabricius, Syst. Ent., 1775, p. 346.

Claws with from two to six teeth near the base of their inner border. Median segment without a stigmatal groove. Stigma of the first dorsal abdominal plate behind its middle. Inner margins of the eyes parallel in the female; more or less convergent in the male. Clypeus somewhat rounded anteriorly, usually with a median depression or notch. Second cubital cell higher than broad. Tarsal comb present in the female. Comb teeth of the hind tibial spine spaced, tooth-like. Last ventral abdominal plate of the female arched but without a median longitudinal ridge. Ventral abdominal plates of the male flat; those of the fourth and fifth segments silky sericeous. Abdomen rising sharply behind the petiole and to a considerable height, particularly in the female. First and second segments of the filament of the antenna short in the male, together not much longer than the first segment in the female. (Plate IX, figs. 15, 16; Plate X, fig. 24.)

The genera *Priononyx*, *Harpactopus*, and *Gastrosphaeria* appear to have been established by their authors mainly on the number of teeth present on the tarsal claws. This character is too restricted, however, as many forms which are widely separate would be brought into near relationship if this were the only criterion, while nearly related species as shown by a comparison of all their characters, but which differ in the number of claw teeth, would be widely separated. Kohl has already called attention to the unnaturalness of these groups and has united them, giving practically the description above. He has selected the name *Harpactopus* for the group, but as *Priononyx* was used nearly ten years earlier I prefer that name, for in either case the name does not carry its original significance, the group having been redefined and its limits changed.

CHLORION (PRIONONYX) FERRUGINEUM (Fox).

Sphex (*Priononyx*) *ferrugineus* Fox, female, Ent. News, III, 1892, p. 170.

Type.—One female from So. Cal. (so the label on it states) now in the National Museum in Washington. (Type, Cat. No. 1867, U.S.N.M.)

Male cotypes (now first described): Five males; two taken at Congress Junction, Arizona, July, by F. H. Snow, and now in his possession; one taken at Albuquerque, New Mexico, and in the collection of Dr. W. H. Ashmead; one from Los Angeles County, California ("coll. Coquillett"), in the United States National Museum; and one from Rincon, New Mexico, taken July 5, now in the collection of the Massachusetts Agricultural College in Amherst, Massachusetts.

The following description was prepared from the female type:

Slender; head large; body in general pale ferruginous, with considerable dull white to yellowish, long pubescence and hairs; wings hyaline.

Female.—Head broad, slightly excavate in front, well rounded behind; clypeus ferruginous, somewhat convex, quite densely covered with yellowish-white pubescence and long hairs; anterior edge making quite a smooth, regular curve, and slightly or not at all reflexed; frons depressed along its middle, ferruginous, densely yellowish-white pubescent as far up as opposite the posterior ocelli; area around the ocelli darker than the rest of the frons, more or less black; distance between the posterior ocelli about equal to their distance from the eye; a groove extends backward from the median ocellus between the lateral ones, along which the ferruginous color is present; vertex and cheeks ferruginous, with rather sparse, whitish pubescence on the cheeks, which are broad above but taper rapidly downward to the level of the lower edge of the eye, where they suddenly widen, forming a broad articulation for the mandible; the tapering part of the cheek bears numerous long, white hairs; eyes black, large, converging somewhat toward the clypeus and without a projection toward the middle at the vertex; antennæ; scape, pedicel, and proximal part of the first filament segment ferruginous; remainder black; scape with a few short, whitish hairs; relative length of filament segments $\frac{1}{19}$, $\frac{2}{10}$, $\frac{3}{10}$, $\frac{4}{9}$; mandibles pale ferruginous to yellowish, their tips dark; two toothed, the teeth quite blunt (in the type), not reaching the base of the other mandible; with a row of pale hairs on the hinder surface.

Thorax.—Ferruginous; neck slender, short; collar broad from front to rear, its anterior face strongly convex laterally and quite so vertically; its dorsal edge broad both laterally and from front to rear; the anterior face and dorsal edge whitish pubescent, less so at the sides; prothoracic lobe large, quite densely pubescent, with a smooth, rounded elevation at its base above; propleuron and prosternum sparsely covered with short, whitish hairs; mesonotum ferruginous, slightly darker behind, quite densely pubescent except on a pair of parallel, rounded ridges arising near the front of the plate and extending backward, which are unclothed; mesopleura and mesosternum ferruginous, the former quite densely, whitish pubescent; the latter with a few short, scattered hairs; scutellum elevated, somewhat impressed in the middle but hardly bituberculate, slightly pubescent, ferruginous; postscutellum ferruginous, narrow, densely pubescent; median segment dorsum with a densely pubescent, yellowish-white band along its middle, its sides black, obliquely aciculate and naked; angle between the dorsum and the posterior end slight, the end and sides of the median segment densely pubescent; stigmatal groove absent; metapleura ferruginous, anteriorly coarsely, obliquely aciculate and punctured; behind, nearer the hind coxæ, pubescent; petiole ferruginous, slightly darker at its base, long, slightly bent upward, naked; as long as the hind metatarsus.

Abdomen.—Ferruginous, rising sharply from the petiole, laterally compressed, elongate posteriorly; above; first two plates lighter, the

others rather darker, glistening, with very minute, scattered punctures and a minute hair here and there; stigma of the first plate near the hinder edge; terminal plate elongate, evenly rounded behind, with rather coarse punctures and hairs near its hinder edge; beneath; ferruginous, darker in some places than in others, the terminal plate long and conical, rounded at its tip and bearing a few hairs.

Wings.—Hyaline, with brownish veins; fore wing; radial cell rather broad, rounded at its tip; second cubital cell higher than broad; third cubital not reaching the end of the radial; third transverse cubital vein joining the radial cell quite close to the second; first recurrent vein joining the first cubital cell close to the first transverse cubital vein, sometimes even interstitial with it; hind wing; transverse median vein somewhat curved, but as a whole making an acute angle with the median vein; anal vein nearly or quite obsolete beyond the transverse median vein; discoidal vein leaving the cubital some distance behind the transverse median, and quite faintly developed; cubital vein obsolete beyond the transverse cubital, and the radial vein extends but a short distance beyond the latter; tegulæ pale ferruginous, white pubescent, particularly on the anterior margin.

Legs.—Ferruginous, the middle and hind pairs long; fore coxæ, trochanters, femora and tibiæ with scattered yellowish-white hairs, the femur with a row of them along a faint groove beneath; fore femora longer than the fore tibiæ, stout, curved; fore tibiæ with a fringe of quite long hairs on the inner and outer sides; fore metatarsus with a tarsal comb consisting of a fringe of very long, slender hairs; the other tarsal segments with numerous long hairs and slender spines; outer side of middle and hind coxæ pubescent; middle femur straight, slightly longer than its tibia, smooth; tibia with small, whitish spines scattered along its surface, its two inner apical spines black; middle tarsi spiny, posterior coxæ somewhat pubescent externally; femur shorter than the tibia, the former slightly pubescent above; tibia pubescent behind, its inner contour straight, its apical spines black, the comb consisting of coarse teeth; tarsi spiny, claws of all the legs ferruginous, with five blunt teeth and the rudiment of a sixth at the base, the inner two (besides the rudimentary one) and the empodium black. (Plate IX, fig. 20.)

The pubescence in many cases is decidedly golden; the amount of black around the ocelli varies, that described above being about an average; the mesonotum is frequently darker than in the type, in some cases being almost black; in worn specimens the middle of the dorsum of the median segment is seen to be black, and the dorsum as a whole tends to be darker than in the type; sometimes the anterior edge and corners of the scutellum are dark like the mesonotum; the bases of the claws tend to be dark; neither recurrent vein of the fore wing is always interstitial; if not it joins external to the transverse cubital

rather than internal; the anal vein sometimes continues a short distance beyond the transverse median; the main (terminal) tooth of the mandible is very long in unworn examples, reaching nearly to the base of the other jaw, and is black, making nearly half the mandible black; there are three teeth to the mandible, the middle one the shortest; the hind coxæ are sometimes pubescent on all sides, the middle pair slightly so; a distinct frontal suture is sometimes evident.

Male.—Differs from the female as follows: Body ferruginous but with more dark and black; anterior edge of clypeus slightly reflexed; scape of antenna varying from dark ferruginous to black varied with ferruginous; rest of antenna black except the pedicel and part of the first filament segment which may be somewhat ferruginous; first filament segment the longest, the relative proportions being $\frac{1}{17}$, $\frac{2}{11}$, $\frac{3}{11}$, $\frac{4}{11}$; mandible dark, but not black, except the tip and base of the posterior tooth; two toothed; thorax varying in color from reddish ferruginous to nearly black; petiole and legs darker than in the female, often nearly or quite black; pubescence everywhere clear white; hinder margin of the third, and the fourth and fifth ventral abdominal plates black, silky sericeous; the others posterior are ferruginous and slightly pubescent; last dorsal abdominal plate conical with rounded tip; margin of fore wing faintly fuliginous.

Length.—Females, 15–20 mm.; males, 10–19 mm.

This beautiful and interesting species has been taken in southern California, chiefly in Los Angeles County; in Arizona, and in New Mexico. The pubescence seems to be more yellow in the California specimens than in those taken elsewhere. I have studied specimens captured at Albuquerque, New Mexico; Congress Junction, Arizona, July; Bill Williams Fork, Arizona, August; and Rincon, New Mexico, July 5, taken on mesquite.

This insect is far from being a typical *Prionomyx*, and for a long time the writer was inclined to place it in the subgenus *Parasphex*. The clypeal characters, the general form of the body and its color, and that of its pubescence, all suggest a close relationship to *Parasphex*, which is confirmed by the first filament segment of the male antenna, which is the longest, while in the species of *Prionomyx* this is not the case in that sex. No representative of *Parasphex* has thus far been discovered in the New World, and as in some regards (the presence of six claw teeth instead of three or four, for example) this species fails to meet the characters designated for *Parasphex*, it seems best to retain it in *Prionomyx*, though it is one of those intermediate forms already alluded to which prevent the groups termed subgenera in this paper being given full generic value.

There is an excellent figure of this insect in The Insect Book, by Dr. L. O. Howard, on Plate XI, fig. 9.

CHLORION (PRIONONYX) STRIATUM (Smith).

? *Pepsis johannis* FABRICIUS, Syst. Piez., 1804, p. 208.
? *Sphex dommerci* LEPELETIER, Hist. Nat. Ins. Hym., III, 1845, p. 357.
Priononyx striata SMITH, Cat. Hym. Brit. Mus., IV, 1856, p. 266.
Sphex (Harpactopus) striatus KOHL, Ann. natur. Hofmus. Wien, V, 1890, p. 356.
? *Sphex (Priononyx) larma* CAMERON, Ann. and Mag. Nat. Hist., 6th ser., XIX, 1897, p. 370.
Sphex striatus DUCKE, Zeits. f. Syst. Hym. u. Dipt., I, 1901, p. 241.

Black, except the abdomen, which is pale ferruginous; wings dark fuliginous, with a violet or even greenish reflection at certain angles; hairs of the body in part dirty white; large, robust insects.

Female.—Head large, broad, having a squarish oblong outline when viewed from above, the cheeks being quite wide; frons somewhat excavated between the eyes; clypeus large, considerably arched, with an anterior reflexed margin, in the center of which is a notch, above which is a median depression of some considerable depth; surface with numerous coarse and many fine punctures; more or less dull whitish pubescent, with numerous long, coarse, black (and a few whitish?) hairs; frons with a pronounced frontal groove; sparsely whitish pubescent at the sides; with an elongate, slightly depressed area above each antennal attachment; surface quite closely, minutely punctured; ocelli inclosed by furrows marking a triangular ocellar area; frontal groove continued behind the anterior ocellus a short distance; top of head some distance behind the ocelli; lateral ocelli about equidistant from each other and from the eyes; vertex minutely punctured, bearing fine black pubescence and a few long, black hairs; occiput similarly clothed, but with quite numerous whitish hairs also; cheeks not quite as wide as the eye, viewed from the side, not narrowing quickly below, with many long, dull white and black hairs, particularly below; eyes parallel at their inner margins; antennæ black, the filament grayish sericeous; scape black, with short black hairs, particularly at the tip on the inner side; relative lengths of the filament segments $\frac{1}{3}_5$, $\frac{2}{2}_4$, $\frac{3}{2}_6$, $\frac{4}{2}_4$, $\frac{5}{2}_0$; mandibles black, with a dull ferruginous tinge near the base of the teeth; stout, grooved on the anterior face from the base to near the base of the anterior tooth, with a smaller, longer groove beneath, and with long black hairs arising from the anterior groove and the posterior face; the mandible is long, almost reaching the base of its mate.

Thorax.—Stout, black; top of the neck and lower part of anterior face of the collar with a few minute punctures; glistening; remainder of that face and the dorsal edge whitish pubescent and bearing a few long, whitish hairs; the dorsal edge evenly rounded; rather closely appressed to the mesonotum; sides of the collar and front of the prothoracic lobe with coarse, oblique ridges, finer anteriorly; a flattish tubercle at the base of the dorsal part of the prothoracic lobe is smooth

and glistening, and the side of the collar above this tubercle is black pubescent; prosternum coarsely, quite closely punctured, and with many long, dull white hairs; mesonotum with its lateral and hinder margins from the prothoracic lobe back strongly reflexed, with parapsidal lines evident and with a distinct and rather broad median groove, broadest anteriorly; surface of the mesonotum marked with well-developed ridges, which near the median groove run parallel to it, but farther out diverge backward and near the anterior edge of the plate become almost transverse, the ridges seemingly radiating from two centers, one on each side of the central median groove and close to the anterior edge of the plate; scutellum high in the middle, with a median groove making it distinctly bituberculate; the surface with minute punctures and with faint, oblique aciculations at the sides; the tips of the tubercles somewhat glistening; postscutellum narrow, minutely punctured, quite closely covered with short, dull white hairs; median segment dorsum rather coarsely, transversely striate, with rows of medium sized punctures between the striæ; its surface quite thickly covered with long, delicate, whitish hairs; with a median depression along the entire length of the plate; angle between the dorsum and the posterior end of the median segment quite sharp, but greater than a right angle; the end coarsely, transversely striated; fovea small, circular; posterior end clothed like the dorsum; an impressed line extends backward at the side of the dorsum from the postscutellum to the stigma, but is absent from there to the fovea; from above the posterior coxæ a ridge extends forward and slightly upward toward the base of the hind wing, below which the body is narrower than above the ridge; the striæ of the dorsum of the median segment are continued laterally over this ridge onto the metapleura, where they run obliquely forward and downward, being strongest near the ridge; mesopleura coarsely striated, the striæ curving around the front of the mesocoxæ and extending a short distance transversely on the mesosternum, which is coarsely punctured; more anteriorly on the mesosternum the striæ are more radiating in arrangement; petiole black, straight, rather sparsely, minutely punctured, and with numerous short, whitish hairs; longer than the second hind tarsal segment.

Abdomen.—Pale ferruginous yellow, darker at the sides and behind than on the first two segments; stout; elongate pointed behind, rather more blunt in front; rising high and nearly at right angles from the petiole; above; glistening, minutely whitish sericeous at the sides of the second and more posterior segments; surface with a few scattered punctures, becoming more evident on the hinder segments; terminal plate with a few long black hairs, its hinder end rounded conical; beneath; color as above, with a tendency to blackish on the posterior lateral angles, and with the posterior margins of the plates slightly

emarginate; posterior half of the terminal plate with noticeable punctures and black hairs.

Wings.—Dark fuliginous with violet or even greenish reflection in some lights; fore wing; end of radial cell rounded; end of third cubital cell extending as far as the end of the radial; second recurrent vein joining the cubital near the second transverse cubital; hind wing; transverse median vein nearly straight, at right angles with the median; the discoidal vein not interstitial; cubital vein with only a short stub beyond the transverse cubital which joins both the cubital and radial nearly at right angles and is but slightly curved; the radial vein well developed beyond the transverse cubital; tegulæ black, slightly whitish pubescent in the center.

Legs.—Long, black; fore coxæ and trochanters coarsely punctured and bearing quite stout, black hairs; fore femora glistening, with a row of stout hairs in a longitudinal internal groove and shorter ones on the opposite side and above; fore tibiæ with stout spines and with long hairs on the inner surface; fore tarsi with stout spines, particularly at the tips of the segments; fore metatarsus with eight comb teeth; tarsus whitish sericeous above; middle and hind tarsi coarsely punctured (but less so than the fore tarsi); with black hairs; sparsely whitish sericeous; trochanters the same; middle and hind femora sparsely, finely punctured, with scattered, black hairs; glistening; middle and hind tibiæ glistening, with scattered, rather short, stout spines and a few fine hairs; the hind tibiæ heavily brownish sericeous behind; hind tibial spine with coarse, blunt, spaced teeth; claws with five teeth, the two outer and the outer part of the claw with a slight ferruginous tinge. (Plate IX, fig. 19.)

In some cases there is no dark shade on the abdomen; the pubescence on the clypeus and frons is more golden; there is a trace of whitish pubescence on the prothoracic lobe near the fringe; the anterior tooth of the mandible is not sharply separated from the middle one; the mesonotal striæ nearest the sides of the plate are nearly parallel to the edge of the plate, leaving an unstriated triangle in front; the wings may be strongly fuliginous and the abdomen a deeper ferruginous; and two punctures between and behind the eyes and ocelli may be quite strongly marked.

Male.—Differs from the female as follows: Clypeus and frons more evidently pubescent; with a broader depression above the notch; the large puncture behind the line from the posterior ocelli to the eyes less marked; cheeks narrower in proportion to the width of the eye; more rapidly tapering below; relative lengths of filament segments $_{1}^{1}_{2}$, $_{1}^{2}_{2}$, $_{2}^{3}_{2}$, $_{2}^{4}_{5}$, $_{2}^{5}_{4}$; occasionally a black spot may be seen on the dorsal surface of the abdomen; sixth ventral abdominal plate with its hind corners rounded, its hinder margin broadly, slightly emarginate; both surfaces of the abdomen rather coarsely whitish sericeous; the first trans-

verse cubital vein of the fore wing is usually quite oblique to the second; legs more sericeous than in the female; inner tooth on the claw smaller than the others.

Length.—Females, 18–28 mm.; males, 18–26 mm.

This insect, which is the largest known American *Priononyx*, has not hitherto been reported from North America, the localities given for previous captures being Brazil and Venezuela. I have studied specimens from the last-named country and also from Cordoba, Argentina, and three (a female and two males) taken at Bill Williams Fork, Arizona, in August, by Prof. F. H. Snow, which bring this species within the geographical limits of this paper. If *Priononyx lærma* Cameron should prove to be the same, Mexico could be added to the habitat, thus giving a continuous northern extension from Venezuela to Nevada for the species, as in the collection of the American Entomological Society is a female 28 mm. long, from Nevada, marked "*magna* Cr." (a manuscript name), and a male 22 mm. long, from Mexico.

CHLORION (PRIONONYX) ATRATUM (Lepeletier).

Sphex labrosa Harris, Cat. An. Mass., 2d ed., 1835, p. 588, (*nomen nudum.*)
Sphex atrata Lepeletier, Hist. Nat. Ins. Hym., III, 1845, p. 355.
Priononyx atrata Smith, Cat. Hym. Brit. Mus., IV, 1856, p. 266.
Priononyx atrata Cresson, Trans. Am. Ent. Soc., IV, 1872, p. 213.
Priononyx brunnipes Cresson, male, Trans. Am. Ent. Soc., IV, 1872, p. 213.
Priononyx atrata Coquillett, Rept. U. S. Dept. Agr., 1885, 1886, p. 298.
Sphex (Harpactopus) atratus Kohl, Ann. natur. Hofmus. Wien, V, 1890, p. 357.
Priononyx atrata Coquillett, Ins. Life, VII, 1894, p. 228.
Priononyx atrata Peckhams, Wisc. Geol. and Nat. Hist. Surv., Bull. 2, 1898, p. 171, pl. XIV, fig. 4.

The type of *brunnipes* Cresson is Cat. No. 1691 of the U. S. National Museum in Washington. It is not in good condition, the interior having been eaten out by museum pests and the terminal abdominal plates destroyed.

Female.—Robust, black; with fuliginous wings having a violet reflection.

Head.—Stout, quadrangular when viewed from above, the frons somewhat excavated between the eyes; clypeus broader than long, arched in the middle, its anterior margin extended laterally beneath the eyes to the base of the mandibles; turning abruptly downward near their inner margins, then running nearly straight across the front, this margin bearing quite a deep notch at its middle, above which is a pronounced depression; surface beneath the eyes smooth, as is also the slightly reflexed rim; the remainder very closely, minutely, and also sparsely, coarsely punctured, with more or less white pubescence and long, rather stout black hairs; near the margin of the central notch the clypeus is tinged with ferruginous; frons minutely punctured and with a few coarser, scattered punctures; sparsely white pubescent at

the sides, slightly black sericeous in the middle, and with a few rather short black hairs; median suture developed, with a noticeable, large puncture near its middle; an oblique suture outside the ocelli joins the frontal suture with a transverse one behind and continuing backward, ends at a faint puncture bearing a macrochæta; vertex and cheeks minutely, closely punctured, sericeous, almost glistening, almost without coarser punctures and hairs except along the border of the occiput and low down on the cheeks, where both become quite abundant; top of the vertex located behind the posterior edge of the eyes; cheeks quite robust, in their widest place wider than half the width of the eye; antennæ black, the filament slightly olive sericeous in some lights; scape with a few scattered punctures and hairs, particularly on the inner side near the tip; pedicel short, black; first segment of the filament longest; relative lengths of filament segments $\frac{1}{2}\frac{1}{2}$, $\frac{2}{1}\frac{2}{4}$, $\frac{3}{1}\frac{3}{1}$, $\frac{4}{1}\frac{4}{3}$; mandibles stout, blackish at base, tinged with ferruginous near the bases of the teeth and peripherally, varying in amount; with numerous longitudinal grooves and three teeth, the anterior one smallest and close to the median one; with a fringe of long black hairs behind and another in front.

Thorax.—Collar with its front and hind faces nearly vertical, the latter quite closely appressed against the mesonotum; lower part of the anterior face smooth, glistening; above this slightly blackish sericeous, with close, minute punctures and more scattered ones and often with a few fine, transverse aciculations; this portion and the dorsal edge sometimes thinly whitish pubescent and bearing black hairs; sides of the collar in front of the prothoracic lobe with fine oblique aciculations except on a small round hump in front of the upper edge of the lobe, which is smooth; prothoracic lobe with a continuation onto its upper part of the aciculations from in front; smooth below, with a few long black hairs and with a dense fringe of short brown hairs on its posterior edge; prosternum with a strongly developed median groove, coarsely punctured, and bearing numerous, quite long, black hairs; mesonotum with a median impressed line extending the entire length of the plate, widest, and with faint edges anteriorly; the surface of the plate blackish sericeous with close, minute punctures and a few scattered, coarser ones and short, black hairs; lateral margin somewhat reflexed from in front of the tegulæ, where there is a trace of aciculation, backward and then inward to where the scutellum rises to its level; scutellum high, rounded, sometimes slightly constricted in the middle in front and behind, giving it a slight dumb-bell shaped outline, its sides and anterior angles slightly aciculate; postscutellum blackish sericeous, dull; median segment dorsum dull black, transversely aciculate, with a shallow, median depression and numerous short, black hairs; with no pronounced suture or other mark between the stigma and fovea, which latter is circular in outline; from the fovea

to the petiole is an impressed line in some cases; posterior end thickly, rather finely punctured and abundantly clothed with long hairs; sides of the median segment and metapleura obliquely aciculate, the aciculations coarsest on the median segment next to the metapleura; covered with quite long hairs; mesopleura also obliquely aciculate, except the portion above the anterior and middle coxæ, where it is less pronounced (the amount and strength of the aciculations vary greatly in different specimens); mesosternum with a median impressed line; aciculate between and just in front of the coxæ, with numerous rather coarse punctures and short hairs; petiole shorter than the hind coxæ, straight, with numerous fine punctures and short hairs; an impressed line runs forward from above the posterior coxa nearly horizontally and below the stigma.

Abdomen.—Stout, high, sharply pointed behind, rising nearly vertically from the petiole; above, stigma of the first segment in the middle or nearly so; surface smooth, slightly glistening, with a few rather fine punctures, and on the last three plates with a few hairs, longest on the last one; fourth and fifth plates very slightly emarginate behind; last plate rounded acuminate behind, covered with very closely set, minute punctures; beneath somewhat sericeous, with scattered punctures and short hairs; fourth and fifth plates somewhat emarginate behind, the latter quite strongly so; last plate conical, very convex, and with a number of long hairs.

Wings.—Fuliginous, lighter on the margin in some cases; fore wing; second cubital cell quite broad; third cubital extending almost as far as the end of the radial cell; second transverse cubital and second recurrent veins sometimes though not usually interstitial; hind wing; transverse median vein slightly arched, making about a right angle with the median vein; discoidal vein not interstitial; cubital vein usually (always?) obsolete beyond the transverse cubital; tegulæ black, tinged with ferruginous behind, sericeous, rather glistening.

Legs.—Coxæ rather short, stout, black, with traces of whitish sericeous on the two hinder pairs in some lights; with numerous coarse punctures and a few hairs, stouter toward the outer end of the segment; trochanters black, the hinder pairs closely, minutely, and also coarsely punctured; anterior pair quite closely, coarsely punctured; all bearing a few rather coarse hairs; femora stout, longer than their tibiæ except the hinder pair; front pair smooth, glistening, with scattered punctures and hairs which are longest in a row along an impressed line on the inner face; the other femora sericeous, with scattered punctures and short hairs; fore tibiæ glistening, with numerous coarse spines and long hairs, the latter chiefly on the inner and hinder faces; middle and hind tibiæ sericeous and coarsely spined; hinder face of the hind tibiæ densely brown sericeous; hind tibial spine with coarse, blunt, spaced teeth on its outer half; fore tarsi

somewhat sericeous above; fore metatarsus with seven long, slender comb teeth externally; there is a faint ferruginous tinge to the fore tarsi, particularly to the last segment and claws, which bear five teeth; the other tarsi are somewhat more sericeous. (Plate VI, fig. 6.)

Male.—Differs as follows: Clypeus rather broadly emarginate anteriorly, its notch and depression usually less pronounced; eyes convergent somewhat, toward the clypeus; mandibles two toothed, the posterior tooth not nearly as long as in the female, and the whole mandible quite slender; cheeks at their widest place less than half the width of the eye; relative length of filament segments $\frac{1}{10}$, $\frac{2}{11}$, $\frac{3}{15}$, $\frac{4}{17}$, $\frac{5}{15}$; first two filament segments quite short; very delicate transverse aciculations present near the middle of the mesonotum; petiole slightly longer than the hind coxæ; abdomen slightly grayish sericeous above in some lights; fourth and fifth ventral abdominal plates velvety brownish black; the following plates without an excavated hinder margin; terminal plate conical, with a rounded hinder margin.

In some cases the pubescence on the clypeus and frons is almost golden instead of silvery; the vertex and cheeks are whitish sericeous; the base of the femora may be slightly ferruginous and the front of the abdomen may have a faint ferruginous tinge; eight teeth in the metatarsal comb have been observed, and the whole body, particularly in southern specimens, may have a strong brownish tinge.

Length.—Female, 15–22 mm.; male, 11–19 mm.

Chlorion (*Priononyx*) *atratum* appears to be our most generally distributed species of this subfamily in North America except *Chlorion* (*Proterosphex*) *ichneumoneum*. I have studied nearly four hundred specimens, taken in Maine, New Hampshire, Massachusetts, New York, Ohio, Michigan, Minnesota, Canada (exact locality?), and Montana, but it does not seem to occur in the Northwest Rocky Mountain region. South of these States it seems to be everywhere present to the southern limits of the United States. I have seen specimens from Alabama, Texas, New Mexico, Arizona, and southern California, but none from Mexico or the West Indies. It is probably found in northern Mexico but is not listed in the Biologia Centrali-Americana as having been taken there. It provisions its burrows with grasshoppers (locusts).

Harris's "*Sphex labrosa*" is a female of this species, numbered 123, and in his record book Harris says: "123. Amophila? labrosus S. Mss. (Allied to Sphex Pensely. L. & D Geer but not half as large as is figured by De Geer.) Is it Ammophila? I think it is. Milton July 15, 1826." Consequently Smith was correct as to the identity of *labrosa* with *atratum*.

A prolonged study of the type specimen of *Priononyx brunnipes* Cresson gives no structural characters not present in *atratum*. The distinguishing feature seems to be the decided brownish color which

is rendered more noticeable by the fact that the contents of the type have been removed by museum pests. In the specimens of *atratum* studied, all shades of color from a jet black to the brown of *brunnipes* occur, and I must therefore regard the latter as a color subspecies, most abundant in the southern States though one specimen from Montana is also of this shade.

This insect is well illustrated in Howard's Insect Book, Plate V, fig. 20.

CHLORION (PRIONONYX) THOMÆ (Fabricius).

Sphex thomæ FABRICIUS, Syst. Ent., 1775, p. 346.
? *Pepsis crucis* FABRICIUS, Syst. Piez., 1804, p. 209.
Pepsis thomæ FABRICIUS, Syst. Piez., 1804, p. 209.
Priononyx thomæ DAHLBOM, Hym. Eur., I, 1843, p. 28.
Priononyx thomæ DAHLBOM, Hym. Eur., I, 1845, p. 439.
Priononyx thomæ SMITH, Cat. Hym. Brit. Mus., IV, 1856, p. 265.
Enodia pubidorsum A. COSTA, Ann. Mus. Zool. Napoli, I, 1862, p. 69.
Priononyx thomæ SAUSSURE, Reise d. Novara, Hym., 1867, p. 43 (in part).
Priononyx thomæ CRESSON, Trans. Am. Ent. Soc., IV, 1872, p. 213.
Sphex thomæ CAMERON, Biol. Centr.-Amer., Hym., II, 1889, p. 36, pl. III, figs. 12 and 12a.
Sphex (*Harpactopus*) *thomæ* KOHL, Ann. natur. Hofmus. Wien, V, 1890, p. 358.
Sphex (*Priononyx*) *thomæ* FOX, Proc. Acad. Nat. Sci. Phila., 1897, p. 378.
Sphex thomæ DUCKE, Zeits. f. Syst. Hym. u. Dipt., I, 1901, p. 241.

Black, to and including the petiole; abdomen more or less ferruginous; pubescence silvery white to yellowish white; wings quite hyaline, faintly fuliginous.

Female.—Head large, quadrangular when viewed from above; front slightly excavated between the eyes; clypeus and frons well covered to about the level of the ocelli with yellowish-white pubescence, least so in the middle; clypeus broad, with a marked median notch, the surface around which is depressed; surface of the clypeus with a few coarse, and many fine punctures; this plate and the lower part of the frons with many long, coarse, white hairs, becoming smaller and shorter above; frontal suture present but not strongly developed; continued faintly between the lateral ocelli; an oblique suture is present on each side of the ocelli; distance between the lateral ocelli about equal to their distance from the eyes; surface around the ocelli and on the vertex whitish sericeous, continued over the cheeks; these are quite full but not as broad as the width of the eye; narrowing quickly below; with many long, white hairs below and a few smaller ones above and on the occiput; eyes parallel in front; antennæ black, grayish sericeous on the filament; scape whitish sericeous over a dull, faint ferruginous tinge; with a few short hairs on its tip inside; relative lengths of filament segments $\frac{1}{24}$, $\frac{2}{15}$, $\frac{3}{15}$, $\frac{4}{15}$, $\frac{5}{13}$; mandibles black, with a dull ferruginous cross band near the base of the teeth; with three teeth, the middle one smallest; mandible long, reaching about to the

base of its mate; with an aciculated groove on its front face leading about to the middle tooth and one beneath, besides a few scattered aciculations near the base; behind is a row of long, brownish hairs.

Thorax.—Collar rather small, its dorsal edge lower than the highest part of the mesonotum; neck above with a few transverse striations in front, and short, fine, white hairs; its hinder part near the collar smooth, glistening; the angle between the neck and collar nearly a right angle; base of the anterior face near the middle bare, glistening, with one or two short, transverse striæ; the rest of this face and the dorsal edge quite densely white pubescent; dorsal edge evenly rounded from front to rear and from side to side, with no median depression, somewhat appressed against the mesonotum; sides of the collar faintly whitish sericeous, obliquely striated near the base of the prothoracic lobe; basal part of the prothoracic lobe very minutely punctured, its hinder half silvery white pubescent and with numerous very fine, long, white hairs; a smooth round hump is present on the collar near the upper part of the base of the prothoracic lobe; prosternum faintly sericeous at the sides, with numerous coarse punctures and long, fine, dirty white to brownish hairs beneath; mesonotum bent strongly downward in front, quite densely black sericeous, with an evident median groove extending about halfway back on the plate; lateral and hinder margins of the plate somewhat reflexed; a silvery white pubescent band extends along each side of the plate from in front of the tegulæ backward to its posterior corners and perhaps a little inward on its posterior margin; area inside these bands minutely, closely punctured; scutellum somewhat higher than the adjacent part of the mesonotum, with a slight median depression, somewhat sparsely silvery white pubescent, its sides behind, slightly, obliquely aciculate; postscutellum silvery white pubescent in the middle, its sides blackish sericeous; median segment dull black on the dorsum, showing faint traces of transverse aciculation and rows of fine punctures, sparsely clothed with whitish hairs of medium length; angle between the dorsum and posterior end of the median segment obtuse, though quite sharp; fovea a circular depression a little below the angle; posterior surface slightly, not closely aciculate, bearing longer whitish hairs than those on the dorsum; from the stigmatal region laterally the rugosity is greater and the lines above run almost horizontally, but below they extend more obliquely forward and downward, crossing an impressed line which runs forward from the hind coxæ onto the metapleura, being quite coarse where they cross this line; sides of the median segment and metapleura sparsely covered with whitish hairs; metapleura obliquely rugose, most finely so near the base of the hind wings, with a small, silvery whitish spot of pubescence often, just above the hind coxæ; mesopleura coarsely, obliquely rugose, finest behind and above the prothoracic lobe; with scattered, coarse punctures along the

grooves; sparsely clothed with short, whitish hairs; mesosternum coarsely, sparsely punctured, glistening, and with a few, short, transverse striæ between the mesocoxæ; petiole straight, brownish black, finely, not closely punctured, longer than the posterior coxæ and bearing short, whitish hairs.

Abdomen.—Ferruginous, sometimes shaded with darker; pointed behind, elongate, less so anteriorly but not rounded, rising quite high above the petiole but not at right angles with it; above, rather glistening, with traces of whitish sericeous at the side; stigma of the first segment behind the middle; with a few scattered punctures, most abundant on the last two plates where there are also a few whitish hairs; margin of last plate rounded behind; beneath, similar to above, the hinder margins of the fourth and fifth plates slightly emarginate, however; terminal plate conical, with a narrow, rounded tip.

Wings.—Almost hyaline, the front pair faintly fuliginous; the larger veins dark, the smaller ones light brown: fore wing; third cubital cell quite long, extending about as far out toward the wing margin as the outer end of the radial cell; first and second transverse cubital veins running about parallel: hind wing; transverse median vein straight or almost so, making a right angle or slightly less with the medial vein; discoidal vein not interstitial; cubital vein not developed beyond the transverse cubital which joins the radial almost at a right angle; tegulæ dull brownish, lighter at the edges, somewhat whitish pubescent anteriorly.

Legs.—Black, but with a brownish ferruginous tinge, somewhat glistening, generally more or less whitish sericeous; front and hind pair of coxæ so much so as to be almost pubescent; fore coxæ with coarse, scattered punctures and rather fine hairs, the punctures absent from the other coxæ; fore trochanters with a very few punctures and hairs, middle pair with fewer, hind pair with almost none; fore femora with a slight groove beneath, along which is a row of short, brownish hairs; fore tibiæ short, rather stout, with numerous spines; fore tarsi strongly white-sericeous above; the fore metatarsus with seven (sometimes six) long comb teeth alternating with very short spines; claws ferruginous, with five teeth; middle femora with a very few fine punctures and short hairs; middle tibiæ minutely punctured, with numerous spines; hind femora with a few scattered, minute punctures and fine hairs beneath; posterior surface of hind tibiæ densely brownish sericeous; the tibial spine with coarse, spaced blunt teeth on its outer half.

Male.—Differs as follows: Body generally more hairy; with coarser punctures on the sides of the thorax; abdomen quite compressed laterly, somewhat crescentic in outline when viewed from the side; first and second segments of the filament taken together not equal in length to the third; fourth and fifth ventral abdominal plates silky

sericeous; abdomen generally with more dark or black on it than in the female; pubescence generally somewhat more developed.

Length.—Females, 12–21 mm.; males, 8–14 mm.

This species is essentially tropical and subtropical in distribution. First described from St. Thomas, I have seen specimens from Cordoba, Argentina; and from Brazil, Cuba, Jamaica, Mexico, Texas, New Mexico, California, Utah, Nevada, Colorado, Arizona, and Montana. Specimens from Florida; Camden County, New Jersey; Raleigh, North Carolina, and Georgia, which I have also studied, seem to be intermediate between this species and the next (*C. biforeolatum*), agreeing in some characters with the one, and in others with the other, and it has finally seemed necessary to name them in accordance with the preponderance of these characters.

Characters separating *Chlorion thomæ* from *Chlorion biforeolatum*.

For this purpose Kohl gives numerous distinguishing features, particularly relating to comparative measurements of different parts of the body. Tests of these on several hundred specimens have not given satisfactory results as a whole, so many examples agreeing in part with one set and in part with the other. The following characters seem to the writer to be those most useful in separating the species, but only when taken together. The female *C. thomæ* has the sculpturing of the thorax everywhere developed; the ridges from the base of the hind wing to the median segment stigma run nearly horizontal; pubescence is present on the prothoracic lobe and above the middle and hind coxæ and is generally quite strongly developed; the wings are more hyaline and the average size of the individuals is larger. The female *C. biforeolatum* may have the sculpturing of the thorax everywhere developed, but there is a strong tendency for it to be replaced, particularly on the dorsum of the median segment and on the sides of the thorax by a dull, lusterless black, which shows no markings of any kind. The ridges between the base of the hind wing and the stigma of the median segment run more obliquely downward and forward; traces of pubescence may be present where they are in the other species, but they are merely traces; the wings are somewhat more fuliginous everywhere, and the average size is less.

The males are more readily distinguished. In *C. thomæ* the length of the first two segments of the filament taken together is less than that of the third, and the posterior margins of the sixth and seventh ventral abdominal plates, though sometimes slightly emarginate, are never excised, though in one or two cases I have seen specimens in which slight elevations at the sides with a depression in the middle gave a very deceptive appearance to these segments. In *C. biforeolatum* the length of the first two segments of the filament taken together exceeds the length of the third, and the posterior margins of the sixth

and seventh ventral abdominal plates each have a broad, quite deep excavation (fig. 11).

The extreme difficulty in separating these species, particularly from North Carolina, Florida, and elsewhere in that region, has frequently raised the question during their study whether they are not really the the same, with dimorphic males.

None of the specimens I have studied agree with *C. excisus* Kohl, though several were taken in the same locality as his specimens of this species. He separates *excisus* from *bifoveolatum* by comparative measurements of different parts of the body, and in some cases I have found individuals which in some of these measurements agreed with those given for *excisus*, but in the others agreed with those given for *bifoveolatum*. In consequence I must place *C. excisus* Kohl as one of the species unknown to me, though with some question as to its being a valid species.

Illustrations of *Chlorion thomæ* are given in the Insect Book, Plate VII, fig. 6, and Plate XI, fig. 7, the latter figure being wrongly named.

CHLORION (PRIONONYX) BIFOVEOLATUM (Taschenberg).

Priononyx thomæ var. SAUSSURE, Reise. d. Novara, Hym., 1867, p. 43.
Priononyx bifoveolata TASCHENBERG, Zeits. f. d. ges. Naturw., XXXIV, 1869, p. 408.
Priononyx thomæ PATTON, Proc. Bos. Soc. Nat. Hist., XX, 1880, p. 384.
Priononyx canadensis PROVANCHER, Addit. faun. Ent. Can., 1889, p. 258.
Sphex (*Harpactopus*) *biforeolatus* KOHL, Ann. natur. Hofmus. Wien, V, 1890, p. 360.
Sphex (*Priononyx*) *bifoveolatus* FOX, Proc. Acad. Nat. Sci. Phila., 1897, p. 378.

Black except the abdomen, which is varied with ferruginous; well clothed with gray hairs; wings quite hyaline to somewhat fuliginous.

Female.—Head large, broader than the distance between the outer edges of the tegulæ, slightly quadrangular, the cheeks being quite full above; frons slightly excavated between the eyes; clypeus and frons pale yellowish pubescent to the ocelli, least so in the middle; clypeus broad, square below, with a deep central depression of the anterior edge, which is slightly reflexed; its surface with scattered punctures and bearing quite long, pale yellow hairs, true also of the frons; ocelli surrounded by sutures inclosing them in a triangular area; frontal suture evident; lateral ocelli about equidistant from each other and from the eyes; vertex sparsely, minutely punctured, whitish or grayish sericeous in some lights, with numerous medium long, gray hairs; cheeks quite broad above, narrowing rapidly below, gray sericeous, with scattered punctures more abundant and larger below, with scattered gray hairs above, longer and more abundant below; inner edges of eyes very slightly nearer at the clypeus than at the vertex, but their lower portion parallel; antennæ black, scape slightly grayish sericeous and with a few gray hairs; filament slightly sericeous, their

relative segment lengths $\frac{1}{18}$, $\frac{2}{13}$, $\frac{3}{12}$, $\frac{4}{12}$, $\frac{5}{12}$; mandibles long, each reaching to the base of the other; black with a ferruginous tinge near the base of the teeth; 3-toothed, the anterior tooth the smallest.

Thorax.—Black, with traces of pale yellow to silvery white pubescence on the dorsal edge of the collar, sides of the mesonotum, middle of the scutellum and postscutellum, and above and somewhat in front of the middle and hind coxæ and on the posterior end of the median segment; quite long gray hairs generally distributed; neck black sericeous, as is also the anterior face of the collar except at the junction with the neck, where there is a bare space showing faint transverse rugosities; sides of collar less sericeous than the front; prothoracic lobe with a faint trace of whitish pubescence; mesonotum black sericeous except where pubescent, its sides and hinder end slightly reflexed, with a perceptible median groove on the anterior half of the plate; scutellum black sericeous except for a spot of silvery whitish pubescence on its middle which is higher than the mesonotum; with no perceptible median groove; postscutellum black sericeous, with a faint pubescent spot in the middle (these pubescent spots are frequently absent); median segment dull, velvety black sericeous above, with quite numerous long, white or gray hairs; a slight broad hollow is present in front of the fovea, which is small and circular in outline; posterior end forming quite an angle with the dorsum, though less than a right angle; its surface often with traces of silvery white pubescence and with many long gray hairs; sides of the median segment clothed with similar hairs; a groove runs nearly horizontally forward from the posterior coxæ; above this on the sides of the median segment are fine ridges running downward and somewhat forward and in part continued across the groove onto the metapleura; mesopleura coarsely vertically rugose below in front, these rugosities disappearing on the hinder part, but with scattered punctures on both parts; a trace of silvery white pubescence just above the mesocoxæ; metapleura dull black, sericeous, sometimes with a trace of a very short, silvery white pubescent band just beneath the posterior end of the groove, between the metapleura and the median segment; meso- and metapleura with numerous long gray hairs; mesosternum with the rugosity from the mesopleura continued onto it for a short distance; coarsely punctured and with long gray hairs; petiole black, straight, with numerous long white or gray hairs, most abundant near its base; noticeably longer than the second hind tarsal segment.

Abdomen.—Dull ferruginous with darker shading, particularly on the hinder dorsal plates; rising high but not sharply above the petiole; ovate; pointed rather more behind than in front; above, glistening, with traces of white sericeous at some angles; hind edges of the dorsal plates paler than the remainder; terminal plate rounded acuminate behind, quite compressed laterally; bearing a few scattered punctures;

beneath; glistening, with irregularly located darker areas; posterior margin of the fourth plate slightly, broadly emarginate; terminal plate conical, with a few scattered, quite long, dark gray or brownish hairs; first ventral plate (behind its petiolar part) ferruginous.

Wings.—Nearly hyaline, though varying much in this regard, the outer margins more fuliginous than the rest; basal half of the fore wing with a faint yellowish tinge; fore wing: second cubital cell much higher than wide; first recurrent vein interstitial or nearly, with the first transverse cubital; second recurrent vein joining the third cubital cell a little beyond the second transverse cubital; hind wing: transverse median vein almost straight, forming nearly a right angle with both the median and anal veins; discoidal vein not nearly interstitial; cubital vein absent beyond the transverse cubital; radial extending only a short distance beyond the latter; tegulæ dull brown, almost black, the anterior part slightly whitish sericeous.

Legs.—Black, strongly whitish sericeous; coxæ coarsely punctured, more sparsely on the hinder legs; with scattered, long, whitish hairs; trochanters similar, but more sparsely punctured; femora still more sparsely punctured or not at all; fore femora with a row of medium long hairs on the inner face; tibiæ not punctured; fore tibiæ with a row of hairs on the inner face; hinder face of hind tibiæ strongly brownish sericeous; anterior metatarsus with six (sometimes seven) long, stout comb teeth alternating with very short ones; claws with five black teeth, the inner one small; tips of the claws dull, dark ferruginous.

Male.—Differs as follows: Lateral ocelli very slightly nearer each other than to the eyes; relative length of filament segments $\frac{1}{7}$, $\frac{2}{7}$, $\frac{3}{10}$, $\frac{4}{10}$, $\frac{5}{10}$; mandibles black, two toothed, not reaching across to the base of the other one of the pair; sides of the thorax rather more coarsely marked and more hairy than in the female; form of the abdomen bluntly elliptical or oval, the hinder portion bent slightly under; the surface above, whitish sericeous, particularly noticeable on the darker portions; first dorsal plate not rising very abruptly from the petiole; fourth and fifth ventral abdominal plates silky black, sericeous, as is the sixth, the hinder margin of which and of the seventh are broadly, deeply excised, the margins bearing fine, short hairs.

Length.—Females, 11–19 mm.; males, 9–15 mm.

This species was originally described from New Friburg, but is widely distributed in North America. The most northern localities from which I have seen specimens are Truro, Massachusetts; Milford, Connecticut; Long Island, New York, and from Illinois, Wisconsin, Montana, Idaho, and Washington. From these States it is quite generally distributed southward, and I have seen examples from Florida, Texas, New Mexico, Arizona, and California. It has also been reported from Mexico, but I find no record of its capture in the West Indies,

though the literature of this species and of *C. thomæ* is so mixed that references to the latter may in some cases belong here.

The first few dorsal abdominal plates are frequently noticeably silvery pubescent, and this has in some cases been supposed to be a specific distinction, but as this is also quite pronounced in some specimens of *C. thomæ* it can not be relied upon for this purpose.

A good figure of one of the less pubescent individuals of *C. biforcolatum* is given as fig. 23, Plate XI, of the Insect Book.

Subgenus ISODONTIA Patton (genus).

Isodontia PATTON, Proc. Bos. Soc. Nat. Hist., XX, 1880, p. 380.
Isodontia KOHL, Ann. natur. Hofmus. Wien, V, 1890, p. 114.
Isodontia KOHL, Ann. natur. Hofmus. Wien, XI, 1896, p. 319.

Type: Chlorion (*Isodontia*) *harrisi*. (Designated by Patton.)

Claws with two blunt teeth near the base of their inner border. Median segment without a stigmatal groove, rarely with a faint trace of one near the hinder end. Stigma of the first dorsal abdominal plate in front of the middle. Tarsal comb of the female absent. Comb teeth of the hind tibial spine not tooth-like but forming a row of closely set hairs. Inner borders of the eyes parallel or converging downward, the latter especially in the males. Second cubital cell of the fore wing rhombic, rhomboidal or approaching a rectangular form, at least as broad on the cubital vein as it is high. Distance between the second and third transverse cubital veins on the radial cell greater than that between the second transverse cubital and second recurrent veins on the cubital vein. Collar not strongly developed, not as high as the mesonotum. Mesonotum punctured. Dorsum of median segment dull, without markings, or slightly punctured, rarely with transverse striations. Petiole long, generally bent upward. Mandible with two or three teeth; not reaching the base of the other when closed. Abdomen rather flattened dorso-ventrally; in the male with rows of rather coarse, backwardly pointing hairs beneath. Body as a whole usually slender. (Plate IX, fig. 17; Plate X, fig. 26.)

This subgenus is easily separated from those already considered by the strikingly different form of the second cubital cell, in which it comes nearest to *Proterosphex*, and by the length of the petiole. From *Proterosphex* it is distinguished by the absence of a stigmatal groove (except in one case) as well as by other and less noticeable characters. In both it and *Proterosphex* the eyes seem to be carried inward toward the center of the head so that they are nearer each other there than a short distance below, though they may converge toward the clypeus till nearer each other than at the top.

CHLORION (ISODONTIA) EXORNATUM (H. Fernald).

Isodontia exornata H. Fernald, Can. Ent., XXXV, 1903, p. 270.

Cotypes.—Five male and two female specimens now in the collections of the U. S. National Museum in Washington (Type, Cat. No. 6931, U.S.N.M.), American Entomological Society in Philadelphia, Massachusetts Agricultural College, Amherst, Massachusetts, and Dr. W. H. Ashmead, Washington City.

Body rather slender, black, parts of the antennæ and legs and the petiole yellow; wings deep fuliginous, with a slight violet reflection.

Female.—Head; clypeus somewhat arched laterally, with a faint median carina most pronounced posteriorly, sometimes not perceptible; anterior margin quite broad, slightly reflexed, with two short, blunt teeth close together at the middle; surface sparsely covered with yellow hairs; clypeus and frons to the level of the insertion of the antennæ golden pubescent; frons, vertex, and cheeks with scattered punctures and long yellowish hairs; cheeks with a narrow, yellow, pubescent band just behind the eye; eyes slightly converging toward the clypeus; antennæ, first six to eight segments yellow ferruginous, the remainder black; scape with a few yellowish hairs; first segment of the filament longest; mandibles two-toothed, black at the base and tip; elsewhere ferruginous.

Thorax.—Collar faintly punctured, clothed with scattered yellow hairs; its dorsal edge and the posterior margin of the prothoracic lobe golden pubescent; mesonotum black with yellow hairs, rather coarsely punctured and with a short, median groove extending about one-third the length of the plate from its anterior edge; scutellum punctured, the punctures rather more scattered than on the mesonotum; on each side just internal to the attachment of the hind wing is a golden pubescent spot; postscutellum covered with golden pubescence; median segment coarsely punctured; a golden pubescent band on each side passes from a point just lateral to the edge of the pubescence on the postscutellum downward and backward below the stigma to the posterior coxa; posterior end of the median segment between the fovea which is hyphen-like and the petiole, with a somewhat quadrangular, golden pubescent spot; the end and sides of the median segment quite thickly clothed with yellowish-brown hairs; mesopleuron with a somewhat triangular, golden pubescent spot just behind the prothoracic lobe, and sometimes with a smaller one between this and the base of the fore wing; mesopleuron and the upper part of the metapleuron rather coarsely punctured and sparsely clothed with long yellow hairs; petiole long, slightly curved, ferruginous yellow, somewhat darker at the base beneath, with numerous yellowish hairs; its posterior portion yellowish pubescent.

Abdomen.—Base of the first dorsal plate yellowish, the remainder of the dorsal surface black, except that in some cases the hinder margins of the plates are pale; surface faintly pale sericeous and with a few scattering hairs on the posterior plates; beneath, minutely punctured, pale sericeous; terminal plate conical, with a rounded hinder margin.

Wings.—Deep fuliginous, with a slight violet reflection; discoidal vein of the hind wing interstitial with the median and transverse median veins; tegulæ smooth, pale yellow.

Legs.—Coxæ, trochanters, and proximal part of the femora black, hairy, the remainder ferruginous; the black portions sometimes yellowish sericeous, almost pubescent; spines dark ferruginous; tips of the claws nearly black; posterior tibiæ strongly yellow sericeous behind.

Male.—Differs from the female in no important features not true as sexual distinctions throughout this subgenus. The more flattened abdomen and the rows of backwardly pointing hairs on the posterior margins of the ventral abdominal plates, besides the presence of thirteen segments in the antennæ instead of twelve as in the females are ready characters for determining the sex.

Length.—Females, 16–20 mm.; males, 16–19 mm.

I have seen specimens of this beautiful and apparently rare species from Indian River and Biscayne Bay, Florida; from North Carolina and Georgia; and from Willis, Texas, captured there June 11.

At the time the original description was published there was no species of the subgenus known in the United States which closely resembled it. Larger collections, however, have revealed the fact that that most variable species, *Chlorion* (*Isodontia*) *costipennis* Spinola has been taken in Mexico, and that it is sometimes difficult to separate the two by any one character though taken all in all the two look quite different. As *C. costipennis* is an exceedingly variable form it is possible that *C. exornatum* may at some time prove to be but a subspecies, though I am at present far from believing that such is the case.

When specimens of *C. exornatum* were first studied in the course of this work some of those in the collection of the American Entomological Society were found to bear the label "*exornata*," a manuscript name, probably given by W. J. Fox. As it seemed not improbable that this name might have been sent out on specimens it appeared best to retain it for this insect to avoid any confusion which might otherwise arise.

CHLORION (ISODONTIA) COSTIPENNIS (Spinola).

Sphex costipennis Spinola, Mem. Acad. Torino, XIII, 1851, p. 54.
Sphex chrysobapta Smith, Cat. Hym. Brit. Mus., IV, 1856, p. 257.
Sphex petiolata Smith, Cat. Hym. Brit. Mus., IV, 1856, p. 259.

Sphex costipennis SAUSSURE, Reise d. Novara, Hym., 1867, p. 39.
Isodontia costipennis PATTON, Proc. Bos. Soc. Nat. Hist., XX, 1880, p. 381.
Sphex costipennis CAMERON, Biol. Centr.-Amer., Hym., II, 1889, p. 35, pl. III, fig. 10.
Sphex (*Isodontia*) *costipennis* KOHL, Ann. Natur. Hofmus. Wien, V, 1890, p. 382.
Sphex (*Isodontia*) *costipennis* FOX, Proc. Acad. Nat. Sci. Phila., 1897, p. 375.
Sphex (*Isodontia*) *costipennis* DUCKE, Zeits. f. Syst. Hym. u. Dipt., I, 1901, p. 241.

Black or black and ferruginous, the distribution of these colors varying greatly; with golden pubescence and hairs, varying much in abundance and location; legs usually in part ferruginous yellow; petiole very long; wings quite hyaline, sometimes partly fuliginous, generally distinctly tinged with yellow.

Female.—Head broad, not noticeably hollowed in front between the eyes; clypeus broad, extending well downward at the sides, its anterior edge reflexed, nearly straight, with a pair of short, tooth-like projections at the center more or less developed, with a median carina on its posterior half; clypeus and frons to the ocelli usually thickly pubescent and bearing long yellow hairs; vertex and cheeks with many long hairs; cheeks rather more than half the width of the eye, with a narrow band of pubescence just behind the latter; narrowing rather quickly below; scape more or less sericeous and bearing short hairs; first segment of the filament the longest; eyes slightly converging downward; mandibles two-toothed, glistening, generally ferruginous except the base and the tips of the teeth.

Thorax.—Neck very short; collar narrow from front to rear, rising sharply at right angles to the dorsal surface of the neck; the dorsal edge of the collar evenly rounded from side to side, the sides of the collar forming a sharp angle with this edge, which is pubescent; a marked depressed line runs back from the middle (in height) of the anterior face of the collar to near the middle of the base of the prothoracic lobe which is pubescent; mesonotum sharply bent downward in front and almost vertical at the sides in front of the tegulæ, with a median groove or impressed doubled line extending back from the anterior margin about one-third of the length of the plate; surface of the plate quite closely punctured and bearing numerous hairs; scutellum rather broad from front to rear, evenly rounded, with a pubescent spot on each hinder corner; postscutellum pubescent, apparently with a faint median impression; dorsum of the median segment closely, rather coarsely punctured, sometimes pubescent; fovea small, slightly crescentic rather than hyphen-like; posterior end from the fovea to the petiole with a quadrangular, pubescent spot; sides of the median segment closely punctured and with fine, nearly vertical aciculations; a pubescent band runs from the hind coxæ forward and upward below the stigma to the front corner of the dorsum; meso- and metapleura coarsely, closely punctured, the latter the least of the two; petiole

long, slightly curved, with fine punctures and hairs; somewhat sericeous, almost pubescent on its posterior part.

Abdomen.—Rather ovoid, more pointed in front than behind; flattened beneath, very coarsely grayish sericeous, both above and below; posterior margins of the third, fourth, and fifth ventral plates emarginate, this increasing posteriorly; terminal plates above and below with scattered hairs, together quite conical in form.

Wings.—Generally quite hyaline, sometimes more or less fuliginous on the anterior and outer margins; generally with a strong yellow tinge.

Legs.—Black, ferruginous, or both colors, the coxæ, trochanters, and basal half of the femora being black, as are frequently the outer segments of the tarsi also; strongly sericeous, often pubescent in spots on the coxæ and femora.

Male.—Differs from the female apparently, only in being more strongly punctured, more generally pubescent, and in the usual sexual characters.

Length.—Females, 18–23 mm.; males, 13–22 mm.

Chlorion (*Isodontia*) *costipennis* is a well known South and Central American insect, having been captured in Brazil, Surinam, Guiana, Guatemala, Panama, and Costa Rica. I have found no published record of its capture in localities farther north, but have seen specimens taken in Mexico (locality not given) and in Santo Domingo, which bring it farther within the faunal limits of this paper.

It is an exceedingly variable species as regards coloration, the amount of pubesence, etc., which in some cases renders it difficult of determination.

CHLORION (ISODONTIA) AZTECUM (Saussure).

Sphex aztecus Saussure, Reise d. Novara, Hym., 1867, p. 38.
Isodontia azteca Patton, Proc. Bos. Soc. Nat. Hist., XX, 1880, p. 381.
Sphex azteca Cameron, Biol. Centr.-Amer., Hym., II, 1889, p. 35, pl. III, figs. 9, 9a.
Sphex robusta Cameron, Biol. Centr.-Amer., Hym., II, 1889, p. 36, pl. III, fig. 11.
Sphex (*Isodontia*) *macrocephalus* Fox, Ent. News, I, 1890, p. 137.
Sphex (*Isodontia*) *aztecus* Kohl, Ann. natur. Hofmus. Wien, V, 1890, p. 385.
Isodontia azteca Patton, Ent. News, IV, 1893, p. 302.
Isodontia azteca Patton, Proc. Ent. Soc. Wash., III, 1894, p. 46.
Sphex (*Isodontia*) *macrocephalus* Kohl, Ann. natur. Hofmus. Wien, X, 1895, p. 50.
Isodontia azteca H. Fernald, Can. Ent., XXXV, 1903, p. 269.
Isodontia macrocephala H. Fernald, Can. Ent., XXXV, 1903, p. 269.

Type of *macrocephalus* Fox, one female, slightly imperfect, in the collection of the U. S. National Museum (Type Cat. No. 9906, U.S.N.M.), from which the following description has been prepared:

Female.—Large, robust, black, without pubescence. Head large, rather quadrangular when viewed from above; clypeus arched laterally, coarsely punctured, covered with long, coarse, black hairs; with a median carina on its posterior portion; its anterior margin slightly

reflexed, a little rounded, with a pair of short, blunt projections, close together at the middle; frons rather more sparsely punctured than the clypeus, bearing long, black hairs; vertex and cheeks rather coarsely, sparsely punctured; near the upper, inner angle of the eye, on a line drawn through the median and a lateral ocellus is a large puncture with a macrochæta; cheeks nearly the width of the eye, densely clothed below with long, black hairs; inner margins of the eyes parallel or nearly so; antennæ black, the scape with long, black hairs; first segment of the filament nearly one-third longer than the second which is slightly longer than the third; mandibles two toothed, the lateral tooth blunt and with a groove running back toward its base from a central notch at its edge; a nearly obsolete ferruginous band crosses the mandible near the base of the teeth.

Thorax.—Collar sparsely punctured; prothoracic lobe fringed behind with short, pale hairs; mesonotum with a median impressed band anteriorly, extending about one-third the length of the plate; the remainder rather more closely punctured than the collar and covered with erect, black and pale hairs; a trace of a parapsidal groove is present; scutellum and postscutellum smoothly rounded, without a median depression, sparsely punctured; median segment closely punctured, clothed particularly at the sides and behind with long, black, and pale hairs; in some lights a faint trace of an impressed line from the hind coxa to the stigma may be seen; sides of the thorax quite closely and evenly punctured, bearing long, black, and a few pale hairs; petiole less than twice the length of the posterior coxa, slightly curved, bearing minute punctures less abundant toward the abdomen, thinly clothed with long, pale hairs.

Abdomen.—Black, glistening, with a few scattered, black hairs toward the posterior end; beneath glistening, with a few scattered punctures and black hairs, mainly on the terminal plate.

Wings.—Dark fuliginous with a blue or violet reflection; radial cell rather bluntly rounded at the tip; discoidal vein of the hind wing interstitial.

Legs.—Black, glistening; the femora with scattered punctures and hairs; hind tibiæ strongly brownish sericeous behind.

Additional features from other specimens. In some cases there is a trace of silvery pubescence on the sides of the clypeus and the impressed line from the hind coxa to the stigma of the median segment is more evident, being almost a stigmatal groove. In a specimen from Paraguay the tibiæ and metatarsi have a slight brown tinge.

Male.—Head thickly clothed with long black and gray hairs; clypeus long, strongly arched laterally, its anterior margin slightly rounded and with a faint notch at the center; covered with a sparse, silvery-white pubescence which extends up on the frons to the attachment of the antennæ; the surface of the frons closely, quite coarsely

punctured to the level of the ocelli; lateral ocelli nearer each other than to the compound eyes; vertex and cheeks rather less closely punctured than the frons, bearing long, erect hairs; cheeks narrow, less than half the width of the eye; eyes about equidistant at the vertex and clypeus; antennæ black; relative lengths of the filament segments $\frac{1}{12}$, $\frac{2}{12}$, $\frac{3}{13}$, $\frac{4}{15}$, $\frac{5}{17}$, $\frac{6}{18}$, $\frac{7}{16}$; mandibles glistening black, two toothed, neither tooth showing any sign of division into two.

Thorax.—Collar very narrow at its dorsal edge, sparingly punctured, with a trace of silvery pubescence at the sides of this edge in some cases; prothoracic lobe fringed behind with fine, whitish hairs; mesonotum with a median impressed, narrow band on its anterior third; the remainder closely punctured; scutellum broad from front to rear, rather flattened, quite evenly but not very closely punctured; postscutellum narrow, evenly rounded, punctured like the scutellum; dorsum of the median segment very closely, coarsely punctured, quite thickly covered with erect black and gray hairs; fovea somewhat crescentic, shallow, with a faint depression running from its middle toward the petiole; coarsely punctured (possibly with faint elevations instead); sides of the thorax quite evenly but not very closely punctured; an impressed line runs from the hind coxa toward the stigma of the median segment but is very faint and can hardly be called a stigmatal groove; a similar line runs more directly forward to the vertical part of the mesopleuron; petiole black, slightly curved, considerably longer than the posterior metatarsus, bearing numerous long, gray hairs.

Abdomen.—Black, glistening, with numerous short, erect hairs on the posterior plates; the first plate long, rather acuminate and frequently with a trace of ferruginous just behind the petiole; beneath flattened, the third, fourth, fifth, and sixth plates each with a transverse row of hairs projecting backward; the sixth and more posterior plates more or less broadly emarginate.

Wings.—Entirely fuliginous in some cases, the anterior half only in others, with a blue to violet reflection; cubital and subdiscoidal veins of the forewing well developed beyond the ends of the cells; discoidal vein of the hind wing interstitial, the cubital at that point bending sharply forward before resuming its outward direction; the radial and cubital veins of this wing well developed beyond the transverse cubital.

Legs.—Black, sometimes with traces of ferruginous in places; glistening; posterior face of the hind tibiæ strongly brownish sericeous; spines black.

Length.—Females, 18–22 mm.; males, 13–20 mm.

This species does not appear to be very common, though widely distributed. I have seen specimens from Long Island, New York; Belle Plain, Clementon, Riverton, and Glassboro, New Jersey; Philadel-

phia and Westmoreland counties, Pennsylvania; Washington City; Georgia; Chokoloskee, Florida; and from Dallas, Texas; southern Illinois; Virginia; Nevada and California. Two dates of capture are September 30, 1902, at Belle Plain, New Jersey, and September 26, 1904, at Paris, Texas.

There has been some question as to the identity of *C. macrocephalum* Fox with *C. aztecum* Saussure. The two mandibular teeth of the latter as compared with the teeth of the former would lead to the belief that in *C. macrocephalum* the lateral tooth is the result of the fusion of two placing it in the three-toothed group; the relative length of the first segment of the filament as compared with the seventh or eighth is very different in the two, and though these differences are sexual and normal in *Prionomyx* they do not occur as such in *Isodontia*. As Doctor Kohl has seen and studied Saussure's type of *aztecum* I sent authoritative specimens of *macrocephalum* to him for examination and he writes as follows: "Meine *azteca* umfasst die *Is. macrocephala* von Fox, welche dunkelhaarig ist und gleichmässig gebräunte Flugel zeigt, und auch Ihre *Is. macrocephala* var. *cinerea* mit greisen Haaren und Flügeln die an der Vorderhälfte sehr dunkel hinten aber aufgehellt sind." This would seem to conclusively place *macrocephalum* as a synonym of *aztecum*.

CHLORION (ISODONTIA) AZTECUM CINEREUM (H. Fernald).

Isodontia macrocephala var. *cinerea* H. Fernald, Can. Ent., XXXV, 1903, p. 271.

Types: Four females, now located one each in the collections of the U. S. National Museum in Washington (Type, Cat. No. 6932, U.S.N.M.), American Entomological Society in Philadelphia, Dr. W. H. Ashmead in Washington City, and the Massachusetts Agricultural College, Amherst, Massachusetts.

This subspecies differs from the typical form in its clothing, which is more abundant and dirty white in color. The hairs cover the thorax thickly, particularly on the dorsum of the median segment. The silvery white pubescence, of which there is generally only a trace, is also more developed here, usually being very noticeable on the clypeus and frons up to the level of the insertion of the antennæ. Generally, too, the wings are less fuliginous and the violet reflection is correspondingly weaker. The size of the individuals averages about the same as in the typical members of the species.

The specimens of this subspecies seen were captured at Columbia, South Carolina; Enterprise and Indian River, Florida; Georgia; and Dallas, Texas.

CHLORION (ISODONTIA) AURIPES, new name.

‖*Sphex tibialis* Lepeletier, Hist. Nat. Ins. Hym., III, 1845, p. 339.
Sphex tibialis Packard, Guide to Study of Ins., 2d ed., 1870, p. 168.
Sphex tibialis Cresson, Trans. Am. Ent. Soc., IV, 1872, p. 211.

Isodontia tibialis Patton, Proc. Bos. Soc. Nat. Hist., XX, 1880, p. 381.
Sphex (Isodontia) tibialis Kohl, Ann. natur. Hofmus. Wien, V, 1890, pp. 122 and 379.
Isodontia tibialis Ashmead, Psyche, VII, 1894, p. 64.
Sphex tibialis Packard, Journ. N. Y. Ent. Soc., IV, 1896, p. 158.
Isodontia tibialis H. Fernald, Can. Ent., XXXV, 1903, p. 269.

Body quite large, black; outer segments of the legs ferruginous yellow; wings fuliginous with a violet reflection; pubescence golden to yellow.

Female.—Head black, rather quadrangular from above, the cheeks being quite full; clypeus arched laterally, quite long, its anterior corners rounded, the anterior margin slightly excavated from each corner to near the middle, where there is a projecting tooth with a deep notch in the middle separating the two teeth; this margin of the clypeus is bare and somewhat ferruginous in some cases, the rest of the plate being black, yellow pubescent, and covered quite closely with long, brown hairs; frons yellowish pubescent to the insertions of the antennæ, higher at its sides, bearing long, brown hairs; frontal suture evident; lateral ocelli but a short distance behind the median one, the three lying in a curve rather than marking the corners of a triangle; vertex sparsely punctured, bearing long hairs; cheeks broad, half the width of the eye, narrowing sharply below; with a trace of yellow pubescence just behind the middle of the eye; with long hairs, longer, coarser, and more abundant below; inner margins of the eyes slightly convergent toward the clypeus; antennæ black, the outer portion rather brownish or grayish sericeous; scape with numerous short, brown hairs and sometimes slightly sericeous; first segment of the filament the longest; mandibles short, with three teeth of about equal length; the teeth black and the base blackish; the rest of the mandible ferruginous to dull yellow; with faint punctures and scattered hairs.

Thorax.—Neck short, broad; collar rising obliquely backward from the neck to a quite sharp dorsal edge which is evenly rounded laterally and is strongly yellowish sericeous, almost pubescent; posterior face vertical, not closely appressed against the mesonotum; prothoracic lobe slightly yellowish pubescent behind; the entire collar sparsely covered with dark brown hairs; mesonotum bent strongly downward in front and at the sides in front of the tegulæ; its surface finely, sparsely punctured and bearing short, brown hairs; with an anterior, median, impressed line and parapsidal lines perceptible; scutellum rather broad from front to rear, flattened above; its sides quite strongly depressed; with punctures and hairs like those of the mesonotum; postscutellum narrow, evenly rounded, with scattered, fine punctures and hairs; dorsum of the median segment rather coarsely, very closely punctured; with a broad, slight median depression posteriorly, and with many brown hairs; angle between the dorsum and the posterior end slight, located just above the fovea which is

a short, transverse, impressed dash; posterior end and sides of the median segment closely, coarsely punctured, with a tendency toward rugosity at the sides, particularly in front of the stigma; thickly covered with many long, brown hairs; the impressed line from the stigma to the postscutellum well developed; that from the stigma to the fovea nearly obsolete; meso- and metapleura more finely, sparsely punctured than the median segment, bearing numerous long, brown hairs; a spot of yellow pubescence is present above the hind coxa; petiole long, black, considerably curved, minutely punctured and bearing long, brown hairs; its hinder portion pale yellowish sericeous.

Abdomen.—Black, ovoid, more pointed in front, flattened beneath; first dorsal plate not rising sharply from the petiole but nearly continuing the petiolar line of curvature; upper surface quite smooth and somewhat glistening, pale sericeous, with a few scattered punctures and brown hairs on the hinder plates; beneath similar, but with the punctures and hairs rather more equally distributed on all the plates; posterior margin of the fourth plate slightly, of the fifth considerably emarginate.

Wings.—Deep fuliginous; cubital vein of the fore wing only very slightly developed beyond the third transverse cubital; discoidal vein of the hind wing not quite interstitial; tegulæ yellowish mottled with brown; somewhat yellowish sericeous.

Legs.—Long, the coxæ, trochanters and basal portions of the femora black, the remainder pale ferruginous or yellow, the last tarsal segment darker; coxæ, trochanters and femora with scattered, fine punctures and hairs; more or less yellow sericeous; spines of the tibiæ and tarsi brown or black, as are also the tips of the claws; tarsi yellow sericeous above; hind tibiæ strongly yellow sericeous on the posterior face.

Male.—Differs as follows: Clypeus more rounded anteriorly, with a slight central notch but no teeth at the sides of it; the margin black; hinder margins of the dorsal abdominal plates pale; the more posterior plates coarsely gray sericeous; usually without pubescence above the hind coxæ; tibiæ often dark brown instead of ferruginous yellow; otherwise differing only in the sexual characters.

Length.—Females, 17–25 mm.; males, 14–22 mm.

This species seems to belong to the Upper and Lower Austral life zones of the United States, the most northern captures known to me being at Nyack, New York; Long Island, New York; Jeannette, Pennsylvania; Cedar Point and Sandusky, Ohio. From these localities south it appears to be fairly common as far as Chokoloskee, Florida, and Dallas, Texas. Whether it extends much farther west I can not judge, as several other specimens are labeled "Tex." without fuller data. It has not been reported from Kansas, nor does it appear in any of the large collections from the west.

Lepeletier's name "tibialis" being preoccupied, and no available synonym existing, it is necessary to propose a new name for this insect and I have selected "*auripes*" for this purpose.

This insect is pictured as figure 17, Plate VII, in the Insect Book.

CHLORION (ISODONTIA) HARRISI, new name.

Sphex apicalis Harris, Cat. An. Mass., 2d ed., 1835, p. 588 (*nomen nudum*).
?Sphex philadelphica Lepeletier, Hist. Nat. Ins. Hym., III, 1845, p. 340.
‖ *Sphex apicalis* Smith, Cat. Hym. Brit. Mus., IV, 1856, p. 262.
Sphex apicalis Saussure, Reise d. Novara, Hym., 1867, p. 38.
Sphex apicalis var. *mexicana* Saussure, Reise d. Novara, Hym., 1867, p. 38.
Sphex apicalis Taschenberg, Zeits. f. d. ges. Naturw., XXXIV, 1869, p. 414.
Isodontia philadelphica Patton, Proc. Bos. Soc. Nat. Hist., XX, 1880, p. 380.
Sphex apicalis Bruner, Rept. U. S. Dept. Agr., 1884, 1885, p. 400.
Sphex apicalis Cameron, Biol. Centr.-Amer., Hym., II, 1889, p. 35.
Sphex (*Isodontia*) *philadelphicus* Kohl, Ann. Natur. Hofmus. Wien, V, 1890, p. 380.
Isodontia philadelphica, Ashmead, Ins. Life, VII, 1894, p. 241.
Isodontia apicalis H. Fernald, Can. Ent., XXXV, 1903, p. 269.
Isodontia philadelphicus Jones, Ent News, XV, 1904, p. 17, pl. III.

Black with brown and gray hairs; wings more or less fuliginous with violet reflection; pubescence silvery white.

Female.—Head quite large, quadrangular from above; clypeus arched laterally, its anterior margin with rounded corners, slightly emarginate and with two teeth in the middle, separated by a rounded, rather shallow notch; surface silvery-white pubescent and quite thickly covered with long, black and brown hairs; with a trace of a median carina on the dorsal part of the plate; frons with a frontal suture; silvery-white pubescent to above the insertions of the antennæ; rather sparsely, finely punctured and bearing long, black and brown hairs not quite as stout or numerous as on the clypeus; ocelli located in a curve rather than marking the corners of a triangle, the lateral ones nearer each other than they are to the eyes; vertex sparsely punctured; cheeks rather narrow, less than half the width of the eye, narrowing gradually below; with whitish sericeous showing faintly just behind the eye; sparsely punctured and with long, grayish hairs; anterior margins of the eyes slightly converging downward; antennæ black, slightly grayish sericeous in certain lights; scape quite thickly clothed with short hairs; first segment of the filament the longest; mandibles short, black, three toothed, the teeth nearly equal in length, with a faint brownish tinge between the bases of the teeth and the articulation with the head.

Thorax.—Neck short, broad; anterior face of the collar rising sharply and at right angles to the neck; this face rather flat from side to side, sparsely punctured and at the narrow dorsal edge faintly whitish sericeous; posterior face nearly vertical, quite closely appressed against the mesonotum; sides of the collar sparsely punct-

ured and with scattered hairs; prothoracic lobe somewhat punctured and with a posterior fringe of short brown and white hairs; mesonotum bent quite sharply downward in front, and at the sides in front of the tegulæ; its surface not closely, quite evenly, finely punctured and bearing numerous short, gray hairs; with a median impressed line on the anterior third of the plate, and traces of parapsidal lines; scutellum rather broad from front to rear, flattened; postscutellum narrow, evenly rounded; both plates punctured and clothed like the mesonotum; dorsum of the median segment closely punctured, the punctures coarser than on the preceding plates; with a slight depression a little anterior to the fovea; covered quite thickly with long, grayish-white hairs; fovea a short, transverse, impressed dash; posterior end and sides of the median segment punctured and clothed like the dorsum; mesopleura similarly, but rather more coarsely punctured, bearing long, whitish hairs; vertical part of the metapleuron above and in front of the mesocoxa rather smooth, though with a few punctures; glistening; its hinder part below the side of the median segment like this last; petiole quite long, slightly curved, finely punctured and bearing numerous long, gray hairs.

Abdomen.—Ovoid, more pointed in front, glistening, whitish sericeous, not rising sharply or very much above the petiole; with a few scattered, fine punctures and brownish hairs, particularly on the hinder segments; beneath similar, but with the punctures and hairs more equally distributed; the hinder margins of the fourth and fifth plates somewhat emarginate.

Wings more or less fuliginous with violet reflection, the fuliginous being most abundant on the anterior and outer margins; cubital and subdiscoidal veins of the fore wing little more than dark shades beyond the ends of the cells; discoidal vein of the hind wing interstitial; cubital vein little developed beyond the transverse cubital vein.

Legs.—Coxæ, trochanters and femora with scattered punctures and quite long, grayish hairs; more or less grayish sericeous at certain angles, as are the tibiæ and tarsi; spines and claws black.

Male.—Differs from the female as follows: Front of the clypeus with only slight projections in place of the teeth of the female and with a slight emargination between, instead of a notch; mandibles generally with a distinct ferruginous band just behind the bases of the teeth; body in general more hairy.

Length.—Females, 15–19 mm.; males, 13–17 mm.

Chlorion harrisi is a common species almost everywhere east of the Rocky Mountains. The most northern localities from which I have seen it, are Webster, Durham, and Hanover, New Hampshire; Amherst, Riverside, and Concord, Massachusetts; Sandusky, Akron, and Columbus, Ohio; Canada (exact locality not given); northern Illinois; and Fort Collins, Colorado. From the South I have seen

examples taken at Chokoloskee, Florida; New Orleans, Louisiana; Dallas, Texas; and Saussure reports it from Orizaba, Jalapa, and Cordoba, Mexico. These localities indicate that it lives in the Transition, Upper Austral and Lower Austral zones, the Mexican specimens coming from quite high altitudes.

In the Harris collection now at the Boston Society of Natural History are three specimens of this insect, each bearing the number "72." Harris's manuscript record book corresponding to these numbers reads as follows: "72. Ammophila apicalis, S. letter. Sphex probably not a true Ammophila. on umbellate flrs. July 25, 1825. large and small & Dublin N. H. on do. July 22, 1835. Camb. on Asclepias Aug. 1, 1838." I am informed by Mr. Samuel Henshaw that the expression "S. letter," probably means that Harris got the name from Say. There is therefore no longer any question that the reference to Harris for this species is correct. As the name is a *nomen nudum*, however, it can not hold as the name of this insect, and several of the more recent writers have adopted Lepeletier's *philadelphicum* as the correct name. With this view I am not at present able to agree, as Lepeletier's description fails to correspond entirely with this insect, and the type is lost. Kohl also seems now to doubt the identity of Lepeletier's insect with the one under consideration, as he writes me: "Wahrscheinlich ist Sph. philadelphicus Lepeletiers *gar keine* Isodontia."

The specific name *apicalis* Smith would be the next available one for this species, but unfortunately Smith had used this name for another species of the genus nine pages earlier in the same article, thus excluding it from application here in accordance with the law of place priority.

As there have been no other names applied to this insect so far as is known, a new name becomes necessary, and I have selected *harrisi* as being an appropriate one under the circumstances.

The prey of *Chlorion harrisi* consists of Tree Crickets (*Œcanthus*), but whether of more than one species is not recorded. It is illustrated as figure 1, Plate VII, of the Insect Book.

CHLORION (ISODONTIA) ELEGANS (Smith).

Sphex elegans Smith, Cat. Hym. Brit. Mus., 1856, p. 262.
Isodontia elegans Patton, Proc. Bos. Soc. Nat. Hist., XX, 1880, p. 380.
Sphex (*Isodontia*) *philadelphicus* Kohl (in part), Ann. natur. Hofmus. Wien, V, 1890, p. 381.
Isodontia elegans Patton, Ent. News, IV, 1893, p. 302.
Isodontia elegans Ashmead, Psyche, VII, 1894, p. 64.
Sphex (*Isodontia*) *elegans* Kohl, Ann. natur. Hofmus. Wien, X, 1895, p. 72.
Sphex elegans Davidson, Ent. News, X, 1899, p. 179.
Isodontia elegans H. Fernald, Can. Ent., XXXV, 1903, p. 269.

General body color black, more or less ferruginous to yellowish on the abdomen; wings quite hyaline with yellow tinge and somewhat fuliginous; legs partly pale ferruginous.

Female.—Head rather broad, the cheeks broad, giving a somewhat quadrangular outline to the head when viewed from above; clypeus somewhat arched laterally, covered with dense golden pubescence extending up on the frons to near the ocelli, particularly at the sides; both plates bearing many long golden hairs; anterior margin of the clypeus with a median notch, on each side of which it is slightly emarginate, the sides of the notch being slightly prolonged outward beyond the rest of the margin, which is a little reflexed and pale ferruginous; frons black where exposed to view, with a few punctures and numerous long, golden hairs; posterior ocelli quite far apart, but little behind the median ocellus; vertex with a number of rather fine punctures and long, golden hairs; an impressed line runs just in front of the ocelli; cheeks above, more than half the width of the eye, narrowing sharply below, slightly golden pubescent just behind the eyes; with fine punctures and long, golden hairs, longer and closer below; antennæ more or less ferruginous; scape dull, pale ferruginous to black, with numerous short hairs; pedicel varying similarly in color; filament black, slightly glistening at the joints, lusterless between; the first segment longest; mandibles short, three-toothed, the teeth and sometimes the base black, the rest ferruginous, with a very few indentations and a few long, golden hairs on the posterior face.

Thorax.—Collar black, its anterior face quite erect; the dorsal edge evenly rounded laterally, covered more or less closely with golden pubescence; the front and sides and dorsal edge bearing quite numerous, long, golden hairs; the posterior face closely appressed against the mesonotum; prothoracic lobe black, with scattered, long, golden hairs and a fringe of dense, short, yellow ones behind; mesonotum quite closely, rather coarsely punctured, and quite thickly clothed with rather short, golden, and paler hairs; with an anterior, median impressed double line extending back about one-third the length of the plate; scutellum somewhat arched, rather flat above, punctured and clothed a little more sparsely than the mesonotum, and with a trace of golden pubescence at the extreme side; postscutellum golden pubescent, with long, yellow hairs; dorsum of median segment quite coarsely, very closely punctured, with traces of transverse aciculation in some lights, and thickly clothed with long, golden hairs; lateral groove from the postscutellum to the stigma pronounced; fovea a short, transverse dash, below the angle between the dorsum and posterior end, which is coarsely, closely punctured, thickly covered with long, golden hairs and with a trace of golden pubescence just above and at the sides from the petiole; a golden pubescent band runs forward and upward from the hind coxa below the stigma to the side of the postscutellum; meso- and meta-pleura quite closely but rather finely punctured, least so between the two, thickly clothed with long, golden hairs; petiole quite long, somewhat curved, black, with numer-

ous rather fine punctures on the anterior half, nearly smooth behind, where it is golden sericeous, bearing long, yellow hairs.

Abdomen.—Black and ferruginous, the distribution of the colors variable; above, whitish sericeous, especially in some lights, and with a few short, pale hairs on the last four segments, particularly at the sides, and with scattered punctures; beneath, with a few punctures on each segment and short, pale hairs; fourth and fifth ventral plates somewhat emarginate behind; terminal plate quite evenly, rather coarsely punctured.

Wings.—Hyaline, slightly fuliginous along the outer border, tinged with yellowish, the veins pale ferruginous; forewing slightly fuliginous in the first and second cubital cells; discoidal vein of the hind wing interstitial; cubital vein developed only a short distance beyond the transverse cubital vein; tegulæ pale ferruginous varied with paler.

Legs.—Coxæ black; trochanters black or black and ferruginous; femora black or black and ferruginous; tibiæ and tarsi pale ferruginous; coxæ sericeous in places, with fine punctures and long, yellow hairs; trochanters the same; femora with many long, yellow hairs; particularly behind and beneath, the hind femora the least hairy; tibiæ and tarsi yellow sericeous, their spines brownish; hind tibiæ densely yellowish sericeous behind; claws pale ferruginous and black, the distribution of these colors varying.

Male.—Differs little from the female, but is usually more hairy, liable to have less yellow or ferruginous on the body and legs, and shows the usual sexual distinctions.

Length.—Females, 15–18 mm.; males, 15–17 mm.

This pretty species is western and southwestern in its distribution. I have seen specimens from Parker and Fort Collins, Colorado, taken in June and July; from Siskiyou County and other (not indicated) parts of California; from Lower California, Nevada, and New Mexico. The records from this State (mainly from Prof. T. D. A. Cockerell) are as follows: Highrolls, N. M., from May 26 to June 14, '02; Rio Ruidoso ab. 6,500 ft. Wh. Mts., July 19 and 22, on flowers of *Rhus glabra;* Rio Ruidoso ab. 7,500 ft. Wht. Mts., August 3; and La Cueva ab. 5,300 ft. Organ Mts., September 5, on flowers of *Lippia wrightii.* Patton states that it is also found in Florida, but, in the absence of any specimens from intermediate points and any other record from that State, I feel that there is likely to be some error in this record.

Kohl regard *C. elegans* as a variety of *harrisi*, a view which I am not prepared to accept at present. The former has a different distribution from the latter and is very fixed in its characters, and at present I should be as ready to regard it as a subspecies of *C. auripes* as of *C. harrisi*, at least until more evidence than we now have is forthcoming. At all events it seems that our knowledge of the species is yet too slight to unite it with any other.

The prey of *Chlorion elegans* is reported by Coquillett as being *Œcanthus nivcus* De Geer.

Mr. S. Arthur Johnson, of the Colorado Experiment Station, Fort Collins, Colorado, has made some observations on the nesting habits of this species and has kindly sent me the following notes on the subject:

A number of the adults of *Chlorion* (*Isodontia*) *elegans* have been reared by the writer from cocoons taken from the nests. In all these cases they were taken from the adobe banks where *Anthophora occidentalis* makes its home.

In order to make clear the conditions, it should be explained that the latter species nests in vertical adobe bluffs where the material is so hard and dry that it is removed with the knife blade or other tool with great difficulty. The bees much prefer a southern exposure; are sometimes content with a west or east front, but seldom select a place which is not exposed to the sunshine at some hour of the day. Into this hard substance the bees burrow to a depth of from 6 to 10 inches, making the diameter about three-eighths of an inch. At the end of the burrow a cluster of urn-shaped cells is made, stored with pollen, and provided with eggs; the cells and the entrance to the burrows are sealed. In order to make way through the hard material, the bee brings water from the neighboring brook and softens the dirt; the waste material is used in part to build a curious tube-like doorway.

There is reason to believe that *Isodontia elegans* occupies only the discarded burrows of these bees or related species. I have never found the nests in other locations, nor have I found any evidence that the wasps ever dig their own nesting places. On the other hand, the entrance to their homes almost always shows signs of *Anthophora's* work, and in instances where I have dug beyond the cocoons of *Isodontia* I have found the empty cells of the bees at the end of the burrow.

The nests of *I. elegans* are made from 2 to 4 inches within the tunnel and are composed of finely chewed fibers of dead weeds and grass. The food consists of *Œcanthus sp.* or in some cases of nymphs of grasshoppers between 5 and 10 millimeters in length. Usually there are two cocoons in the tunnel, but in one case I found four. The outer portion is tightly packed with grass stems of coarser nature than those used for the nest proper. These fibers are wound round and round the burrow and packed in very firmly and securely. The packing extends to the mouth, where it commonly protrudes slightly. Some tubes were packed with closely arranged sprigs of sage.

The cocoon is composed of fine fibers of silk, and consists of three layers. The outer is a loosely woven mass of silk which often entangles loose materials, legs, and dried parts of the food material, bits of finely chewed grass, etc. Below this is a thin, papery, pinkish layer with a shining surface which appears to be made by gluing the silk together by means of some fluid. This layer is so tight that it doubtless has much to do with regulating the degree of moisture within. The inner layer is yellowish, quite thick, more loosely woven than the middle layer, but more compact than the outer. It fills all the space between the middle layer and the pupa case.

The length of the old larval exuvia in which pupation takes place is 19 mm., breadth 5½ mm., elongated, almost cylindrical in form, but slightly larger at the anterior end. Color, the usual brown of Dipterous larvæ.

Three species of insects bred from these cocoons, sent me by Mr. Johnson, have been identified through the kindness of Dr. L. O. Howard, of the Department of Agriculture in Washington, as *Argyramœba fur* O. S., *Senotainia trilineata* Van der Wulp, and *?Perilampus cyaneus* Brullé. Doctor Howard writes: "I think it very doubtful that this (the last-named species) is a parasite of the *Isodontia*, but it is likely to be parasitic upon the *Argyramœba*."

Subgenus PROTEROSPHEX H. Fernald.

Sphex KOHL, Ann. natur. Hofmus. Wein, V, 1890, p. 115.
Proterosphex H. FERNALD, Ent. News, XVI, 1905, p. 165.

Type.—*Chlorion maxillosum* Fabricius, Ent. Syst., II, 1793, p. 208.

Claws with two blunt teeth near the base of their inner border. Median segment with a stigmatal groove except in *Chlorion* (*Proterosphex*) *lucae*. Stigma of the first dorsal abdominal plate in front of the middle. Tarsal comb of the female present. Comb teeth of the hind tibial spine not tooth-like but forming a row of closely set hairs. Inner borders of the eyes parallel or converging downward. Second cubital cell of the fore wing rhombic, rhomboidal, or approaching a rectangular form, at least as broad on the cubital vein as it is high. Distance between the second and third transverse cubital veins on the radial cell less than that between the second transverse cubital and second recurrent veins on the cubital vein. Last ventral abdominal plate of the female arched. Ventral surface of the abdomen of the male usually without rows of hairs and not silky sericeous. Dorsum of the median segment generally transversely aciculate or rugose. Petiole straight. Mandibles when closed generally reaching each to the base of the other. (Plate X, fig. 25.)

CHLORION (PROTEROSPHEX) LUCAE (Saussure).

Sphex lucae SAUSSURE, Reise d. Novara, Hym., 1867, p. 41.
Sphex belfragei CRESSON, Trans. Am. Ent. Soc., IV, 1872, p. 212.
Sphex lucae KOHL, Ann. natur. Hofmus. Wien, V, 1890, p. 387.
Sphex belfragei KOHL, Ann. natur. Hofmus. Wien, V, 1890, p. 439.
Sphex lucae PATTON, Can. Ent., XXVII, 1895, p. 280.

Sphex belfragei was described from "four male and female specimens found on sumach flowers in August (Belfrage)." Three female specimens from the Belfrage collection now in the U. S. National Museum are labeled "Type No. 1685." One female in the collection of the American Entomological Society is labeled in Cresson's handwriting as being this species. Apparently Cresson was in error as to the sex of some of the specimens, as his description does not apply to any of the males present in that collection, and none are labeled *belfragei*.

Body rather slender; the head and thorax black; the abdomen black to red, the two colors variously mingled in different examples, the males being generally much darker than the females; wings varying from yellowish hyaline with a fuliginous tinge to deep fuliginous with a violet reflection; legs dark ferruginous to black.

Female.—Head black, quite broad; clypeus quite convex, with a smooth, slightly reflexed anterior margin bearing a faint notch at the center, on each side of which is a slight tooth; its surface coarsely,

closely punctured and with long, coarse hairs bending downward, and showing traces of silvery pubescence in some cases; frons finely, closely punctured, the punctures more scattered above and almost absent near the ocelli; on the sides of the frons are traces of silvery pubescence and black hairs are also present, more scattered above and on the vertex and cheeks; vertex sparsely, finely punctured; cheeks narrow, glistening, with scattered minute punctures; eyes converging very slightly downward; antennæ black, the first segment of the filament longest, increasing slightly in diameter toward its tip; mandibles black, two-toothed, with traces of dark ferruginous.

Thorax.—Collar black, with fine, scattered punctures and a few short, black hairs; its dorsal edge rather rounded from front to rear, evenly rounded laterally; prothoracic lobe sparsely covered with short, black hairs and with a dense fringe of pale brown hairs behind; mesonotum black, glistening, slightly sericeous, rather closely and finely punctured and bearing scattered, black hairs, with a slight anterior median groove; its lateral margin reflexed from in front of the tegulæ to where it meets the scutellum; scutellum glistening black, very minutely punctured, with a rather deep, median groove; postscutellum similarly punctured, glistening black; dorsum of the median segment dull black, finely, transversely aciculate, thickly covered with short, white hairs; its outline sharply marked by a groove extending from the side of the postscutellum to the stigma, and thence to the fovea, the area thus marked being shield-shaped; stigmatal groove absent; sides and posterior end of the median segment dull black, minutely, closely punctured, quite thickly covered with black hairs at the sides, but mingled with white ones behind; petiole short, straight, black, sometimes slightly tinged with ferruginous, sparsely, minutely punctured, and with a few short, black hairs.

Abdomen.—Usually rather elongate-oval; above, smooth, somewhat glistening, pale ferruginous varied with darker, particularly on the more posterior plates; very slightly sericeous in some lights, with a few pale hairs on the hinder margin of the last plate; beneath of the same color as above, the darker areas more irregularly scattered, giving a somewhat mottled appearance; a few dark hairs are present on the second ventral plate and lighter ones on the last one, while a very few scattered hairs are present on the intervening plates.

Wings.—Yellowish hyaline, somewhat fuliginous on their outer margins; sometimes entirely fuliginous; second cubital cell of the fore wing rhombic; radial cell rather squarely rounded; the second and third transverse cubital veins about as far apart on the radial cell as the former and the second recurrent vein are on the cubital cell; cubital vein obsolete beyond the third cubital cell; transverse median vein of the hind wing making more than a right angle with the median vein; the discoidal vein practically interstitial; tegulæ black in front but with a trace of ferruginous behind; faintly punctured.

Legs.—Coxæ almost black, with a few short hairs; remainder of the legs black to dark ferruginous brown; trochanters with a number of short dark hairs; posterior tibiæ light brown sericeous behind; fore metatarsus with nine (sometimes ten) long, slender comb teeth; bases of the claws lighter than the rest of the tarsus; the claws themselves very minute.

Variations.—In examples with fuliginous wings the abdomen, except the first two and last plates above and beneath, is generally black. The black may also encroach on the posterior part of the second segment and on the sides of the last one.

Male.—Anterior margin of the clypeus extending obliquely downward and inward from the side, then transverse, slightly emarginate, a little reflexed; a faint trace of silvery pubescence sometimes present on the cheek just behind the eye, and another on the posterior end of the median segment or in some cases above the hind coxa; body rather more densely clothed than in the female; sixth and seventh ventral abdominal plates slightly emarginate behind; terminal ventral plate with its hinder border rounded at the sides, acuminate in the middle; terminal dorsal plate evenly rounded; the abdomen generally with an opalescent luster; generally black, but sometimes more or less ferruginous on the first, second, or both segments; legs usually entirely black. In other respects the male resembles the female.

Length.—Females, 17–22 mm.; males, 13–19 mm.

This species appears to be found only in our Southern and Western States and in Mexico. I have studied examples from Tifton and other (unnamed) places in Georgia, Texas, New Mexico (Alamogordo, taken from April 26 to June, 1902, and elsewhere); southern Arizona (F. H. Snow, August, 1902); Los Angeles County, Knight's Valley and Sonora County, California; Ormsby County, Nevada (July 6, Baker); Lewiston, Idaho; Yellowstone, Montana (August, 1883); Yakima River near Ellensburg, Washington (July 8, 1882); and from Lower California, and Guadalajara in Jalisco, Mexico.

That there is no error in placing *C. belfragei* Cresson as a synonym of *C. lucae* is shown by the fact that a homotype of the former sent to Kohl, who studied Saussure's type, was returned marked "*Sphex lucae* Sauss. certissime."

A picture of this insect under Cresson's name is given as figure 10, Plate XI, of the Insect Book.

CHLORION (PROTEROSPHEX) CUBENSIS, new name.

?*Sphex lanierii* Guerin, Icon. d. Regne Anim. Cuv. Ins., VII, 1845?, p. 433.
‖*Sphex claripes* Kohl, Ann. natur. Hofmus. Wien, V, 1890, p. 395.

A large, rather robust insect. Body to the petiole, black; petiole, abdomen and legs beyond the middle of the femora pale ferruginous. Wings quite hyaline with a yellowish tinge, slightly fuliginous on the

margins, the amount of yellow and fuliginous varying. Pubescence golden, varying in shade.

Female.—Head rather quadrangular from above, the front slightly rounded between the eyes; clypeus not extending far below the eyes, quite arched laterally above, thickly clothed with pubescence and long, quite stout, golden hairs; its anterior margin strongly rounded, with a pair of short, rather pointed, broad based teeth at the middle separated by a notch, and another just outside each tooth separating it from the margin; frons densely pubescent to above the level of the median ocellus, with long, golden hairs, growing shorter above; distance from a lateral ocellus to the eye about equal to that between the ocelli; vertex and occiput densely brownish-black sericeous, with numerous long, golden hairs, with an oblong-oval, slightly raised area just behind the ocelli; cheeks about two-thirds to three-quarters the width of the eyes, pubescent from near the top to near the bottom of the eye and nearly their whole width, and bearing numerous long, golden hairs, longest and largest below; inner margins of the eyes about parallel; antennæ black, black-sericeous but toward the tips rather grayish in some lights; scape with numerous rather fine punctures and short, golden hairs, particularly on the inner side; relative lengths of the filament segments 3^{1}_{5}, 2^{2}_{0}, 2^{3}_{0}, 2^{4}_{0}, 1^{5}_{7}; mandibles long, the tip of each reaching the base of the other; black with a slight ferruginous band between the base and the bases of the teeth; their lower surface strongly longitudinally rugose (striate?); with a row of long, golden hairs on the posterior face and a few scattered ones in front.

Thorax.—Neck with a pubescent band crossing it above and turning backward at the sides; collar closely appressed against the mesonotum, its anterior face almost at right angles to the neck except near its base, where it is oblique for a very short distance; all except this oblique part quite thickly pubescent, least so in the middle, and with numerous long, golden hairs; dorsal edge of the collar somewhat flattened in the middle; the lower half of its lateral face black, finely punctured, the black continued down to the edge of the plate; prothoracic lobe black in front, pubescent behind, and with rather short, golden hairs; prosternum pubescent in front of each coxa, its whole surface with many long, golden hairs; mesonotum with a broad pubescent band on each side extending downward in front of the tegula to the prothoracic lobe, narrowing somewhat posteriorly and bending inward on the hind margin of the plate to meet the band from the other side; the rest of the plate densely brownish-black sericeous, velvety, except for a trace of golden pubescence along the anterior median groove and extending back about half the length of the plate, the groove itself being concealed by this; the plate also has numerous short, erect golden hairs and its lateral margin is somewhat reflexed; scutellum rather arched, very slightly notched in the middle behind,

its flattened upper surface densely brownish-black sericeous; its posterior and lateral sloping surfaces golden sericeous, almost pubescent; postscutellum golden pubescent as far to the sides as the beginning of the groove on the median segment; dorsum of the median segment entirely, very thickly pubescent, the fovea a rather short crescent; posterior end making quite a sharp angle with the dorsum, densely pubescent; sides with a broadening pubescent band running forward from above the hind coxæ to the stigma, leaving a rather narrow black-sericeous band between it and the posterior pubescence, just above the coxa; dorsum, sides and end thickly covered with erect, yellow hairs, shortest on the dorsum, and so thickly placed as to almost conceal the black band in some lights; mesopleura with a large pubescent spot just behind the prothoracic lobe and extending upward to the base of the fore wing; also with a spot (sometimes a band running upward and forward) above the middle coxæ; the rest black, somewhat sericeous, with scattered, fine punctures and numerous short, golden hairs; metapleura black in front of the pubescent band along the stigmatal groove; mesosternum black, with a tendency toward golden sericeous; with scattered, fine punctures and short, golden hairs; petiole very short, stout, straight, pale ferruginous, golden sericeous, almost pubescent, and with many short, golden hairs; about half as long as the second hind tarsal segment, less than two-thirds as long as the first filament segment and about equal to the second.

Abdomen.—Rising quite high above the petiole, pale ferruginous, sometimes varied with darker, long and pointed at both ends, but more so posteriorly; above, pale sericeous, less so posteriorly, with a few faint punctures on the fourth plate, more and coarser on the fifth, and with many coarse ones on the terminal one, making its entire surface quite roughened; a few rather short, yellow hairs are present on the sides of the fifth plate, more and longer on the last, the extreme lateral edges of which are smooth; this plate is rather narrow and acuminate behind, but without a sharp pointed tip; beneath glistening, with a few minute, scattered punctures and short hairs, both becoming more abundant and coarser posteriorly, but absent on the middle line; on the posterior half of the last ventral plate they become quite coarse and close together, and there are numerous yellow hairs; hinder margin of the terminal plate rather narrowly obtusely rounded.

Wings.—Quite hyaline, distinctly yellowish half way out or more from the base, somewhat fuliginous on the outer margin, particularly at the end of the radial cell and slightly fuliginous over the entire wing, the depth of this varying in different specimens; forewing with the second transverse cubital and first recurrent veins nearly or quite interstitial; the second and third transverse cubitals much nearer on the radial than the second transverse cubital and second recurrent are on the cubital; the third cubital cell not reaching the end of the radial

cell, and the first transverse cubital vein crooked, projecting into the first cubital cell posteriorly and into the second cubital cell near the middle; hind wing with the transverse median vein almost straight, making more than a right angle with the median vein; the discoidal vein nearly interstitial; the cubital vein only a faint trace for a short distance beyond the transverse cubital, which joins the former at quite a sharp angle; tegulæ brownish-black sericeous, with a pubescent spot in the middle.

Legs.—Coxæ, trochanters, part of femora, tips, inner edges and teeth of the claws black; the rest pale ferruginous; the spines of the same color, and the hairs everywhere yellow; legs everywhere more or less pale sericeous; fore coxæ with a pubescent spot in front; fore femora nearly all black; middle pair the same; hind pair about half black; fore metatarsi with eleven (sometimes ten) comb teeth, all short, the first one shortest, and with no alternating short spines; inner contour of the hind tibia sharply bent, suddenly enlarging markedly near the outer end; the hinder face of this segment strongly, coarsely, dark golden sericeous; pulvilli blackish. (Plate VI, fig. 3.)

Male.—Differs as follows: Clypeus squarely truncate in front; mesosternum pubescent; a pubescent band extends from the middle coxæ to the spot behind the prothoracic lobe; middle and hind coxæ more or less pubescent; a pubescent spot is present on the metapleural lobe; the black area at the side of the median segment is nearly concealed by the thickness of the hairs there and the extension of pubescence across; middle femora sometimes partly pubescent; last dorsal abdominal plate rounded behind, with a rather broad notch in the middle; the plate nearly as broad as the preceding one; beneath, the seventh plate is deeply and sharply excavated behind in the middle, and with a slight median ridge on its posterior half; with a thick tuft of rather short, ferruginous hairs on the posterior corners and more or less shorter hairs on the posterior margin; the terminal plate is narrow, bluntly acuminate behind and with a central depression; the surface of the last two dorsal abdominal plates is coarsely brown sericeous.

Length.—Females, 25–30 mm.; males, 25–28 mm.

This beautiful species has thus far been reported only from Cuba.

The identity of Guerin's *Sphex lanierii* does not seem to have been settled with certainty, and I can not learn the whereabouts of the type. Kohl regards it as a synonym of *Chlorion ichneumoneum* Linnæus, though Guerin writes: "Il ne faut pas confondre cette espèce avec le *Chlorion ichneumoneum* de Fab., ou son *Sphex aurulenta*." Specimens of *C. cubensis* in the collection of the American Entomological Society are labled *lanierii* in Cresson's handwriting, showing his opinion on the subject, and Guerin's description agrees quite well with this insect. In any case Kohl's name can not hold, being preoccupied.

CHLORION (PROTEROSPHEX) LAUTUM (Cresson).

Sphex lauta CRESSON, female, Trans. Am. Ent. Soc., IV, 1872, p. 212.
Sphex chrysophorus KOHL, female, Ann. natur. Hofmus. Wien, V, 1890, p. 399.
Sphex lautus KOHL, Ann. natur. Hofmus. Wien, V, 1890, p. 447.
Sphex lanciger KOHL, male, Ann. natur. Hofmus. Wien, X, 1895, p. 55.

Types.—Described from five specimens, indicated as females (probably one of these was the variety also mentioned, leaving four real types). One male is now in the collection of the American Entomological Society, labeled "*S. lauta* Cr.," in Cresson's handwriting; and another specimen, also a male, from Texas, is also present. In the collection of the U. S. National Museum are two specimens from "Texas, Belfrage," marked "Type No. 1687." These are male and female. In the collection at the Museum of Comparative Zoology, of Harvard College, Cambridge, Massachusetts, is a female specimen marked "Dallas, Tex., Boll., 46, Type 521, Sphex lauta Cr." As the five specimens came from "Belfrage, Boll, Heiligbrodt," this would account for all except the Heiligbrodt material, which is probably that retained by Cresson at Philadelphia. It would seem that the sexes were not correctly given in the printed description.

The following description was prepared from the National Museum types, with additional notes from other specimens:

Large, robust, body to and including the petiole black; abdomen pale ferruginous; wings hyaline; pubescence abundant, golden yellow.

Female.—Head broad, rounded oval from above, the cheeks though broad being retreating; clypeus covered everywhere except on the very anterior margin with dense golden yellow pubesence continued up over the frons to the level of the ocelli, the surface also bearing very numerous, long yellow hairs; anterior margin of the clypeus strongly rounded, with a hollow at the middle, from which arise two broad, blunt teeth the tips of which extend to the outline of the general curve of the margin, and between which is a shallow notch; vertex black sericeous, very minutely punctured; just behind the ocelli is an oblong-oval, slightly elevated, velvety black area; the entire vertex with scattered, short yellow hairs; cheeks nearly as broad as the eyes, but sloping inward quite sharply; with a dense golden pubescent spot near the middle and with many long yellow hairs below and behind this spot; inner margins of the eyes parallel; antennæ dull black, the scape quite stout, very slightly sericeous or pubescent beneath and with a few longer yellow hairs on the upper and inner sides; first segment of the filament the longest, its diameter a little the greatest near its outer end; mandibles large, stout, dark ferruginous, particularly on the large, stout terminal tooth, with short longitudinal aciculations on the under surface of the basal portion, and with long yellow hairs behind.

Thorax.—Collar narrow, its anterior and posterior faces nearly vertical, not appressed against the mesonotum; its entire anterior face and dorsal edge thickly clothed with golden yellow pubescence, least dense in the middle, and bearing long yellow hairs; the pubescence does not extend far down at the sides, exposing the black, minutely punctured surface; prothoracic lobe black, the upper three-fourths of its posterior half covered with golden yellow pubescence and short yellow hairs, the pubesence almost meeting the mesonotal band; its hinder margin with a fringe of short pale hairs; mesonotum with a faint anterior, median, impressed line or narrow band; its central area velvety black; at each side a broad pubescent band extends from just above the prothoracic lobe upward to above the tegula, then back to the hinder end of the plate, narrowing as it goes, then turns inward to meet the band from the other side, the two becoming very narrow behind and barely meeting; a reflexed margin is present on the plate from near the front of the tegula to a short distance in on the posterior margin; the black area of the mesonotum bears many short pale yellow hairs; scutellum black, with a median longitudinal depression; very minutely punctured and sericeous; postscutellum golden pubescent as far laterally as the groove on the median segment leading to the stigma; median segment dorsum and posterior end thickly covered with golden pubescence and long yellow hairs, which do not conceal the grooves which mark the limits of the dorsum nor the fovea; a band of pubescence follows the lateral edge of the dorsum from the postscutellum to the stigma, and thence on both sides of the stigmatal groove to the hind coxa; a space between this band and the pubescence on the posterior end is black, with scattered punctures, and extends to the side of the petiole; mesopleuron with a large golden pubescent spot just behind the prothoracic lobe, with a slight extension upward and forward toward the tegula; just above and in front of the anterior coxæ is a triangular pubescent area extending toward the neck; under surface of the thorax yellow sericeous, in places almost pubescent, with long yellowish hairs, abundant except on the prosternum; petiole short, straight, black, strongly sericeous, almost yellow pubescent, with short yellow hairs.

Abdomen.—Elongate oval, a little longer than the thorax, not quite as wide at its widest place as the distance between the outer edges of the tegulæ; its color above ferruginous, the posterior margins of the plates a little darker, and on the third, fourth, and fifth plates this shade is carried forward on the median line toward the middle of the plate; the entire surface sericeous, smooth, except the terminal plate, which is coarsely punctured and bears a number of long yellowish hairs; beneath, the same color as above, but with darker markings, more irregular in form and position, giving a somewhat mottled appearance; there are a few yellowish hairs at the sides on each plate,

increasing in number backward, and a few scattered punctures occur, particularly on the terminal plate.

Wings.—Yellowish hyaline, a little fuliginous on the outer margin of the fore wings, the yellowish being a little deeper toward the base; first recurrent vein of the fore wing nearly or entirely interstitial with the second transverse cubital; the second and third transverse cubitals very close together on the radial; cubital vein of the hind wing with a slight backward bend near its middle; obsolete beyond the transverse cubital; the discoidal vein not quite insterstitial; tegulæ black, faintly sericeous, with a trace of yellow pubescence near the center; the outer edge slightly reflexed.

Legs.—Coxæ, trochanters and femora black; sericeous, particularly beneath; fore femora yellow pubescent beneath and on the lower part of the outer side; fore and middle tibiæ and tarsi sericeous above, dark ferruginous, the tips of the claws black; fore metatarsi with ten comb teeth, shorter than half the length of the metatarsus; hind tibiæ sericeous, with a dense brown band, coarser than elsewhere, on the posterior face; inner edge of the hind tibia not straight, but curved, hollowing along its middle, rather dilated at the ends. (Plate VI, fig. 4.)

Male.—Differs from the female in the following respects:

Generally more pubescent; the pubescent spot behind the prothoracic lobe larger and extending downward to connect with the spot above the middle coxa; the first recurrent vein not quite as nearly interstitial with the second transverse cubital as in the female; abdomen less oval, being quite broad at the tip; the last dorsal abdominal plate with a slight excavation at the side, behind; thence evenly rounded except for a very slight median emargination; seventh ventral abdominal plate with a weak median carina; its lateral margin curving evenly toward the middle line for some distance, then with a broad, deep notch; with a slight, broad depression running from the base of the carina outward and backward to the posterior angle where the notch begins and a tuft of yellowish hairs just outside this depression, on the margin of the plate; terminal plate small; its posterior margin evenly rounded, with a circular depression in the center of the plate.

Variations.—In some specimens the black band between the pubescence along the stigmatal groove and that on the dorsum and hinder end of the median segment is encroached upon by the pubescence; the abdomen is almost fringed on the hinder margins of the last two or three dorsal plates with short, pale hairs; the median excavation on the hinder margin of the last dorsal plate is sometimes quite pronounced; the mesosternum may be distinctly pubescent, and the hind wings may be slightly fuliginous on the outer border; abdomen sometimes varied with dark.

Length.—Females, 24–27 mm.; males, 24–26 mm.

This is one of our most beautiful species of *Chlorion*, its brilliant pubescence and ferruginous abdomen making it very noticeable, though in some cases the latter is darker and consequently less prominent. It is found rarely in the Southern States, examples having been taken in North Carolina; Cameron and New Orleans Louisiana; (July, and August 20, 1903); and in Texas (Dallas and elsewhere).

Cresson in his original description refers to a variety having a black abdomen, of which he had one specimen, and says: "Should the variety with black abdomen prove to be a distinct species, it may be named *illustris*." This insect is Say's *Sphex habena*, and as its subspecific relation to *lautum* Cresson has not as yet been demonstrated it is included in this paper under Say's name.

CHLORION (PROTEROSPHEX) HABENUM (Say).

Sphex habena Say, Ins. of Louisiana, 1832, p. 14.
Sphex habena Say, LeConte ed., I, 1859, p. 308.
Sphex lauta var. *illustris* Cresson, Trans. Am. Ent. Soc., IV, 1872, p. 210.
Sphex lauta var. *illustris* Kohl, Ann. natur. Hofmus. Wien, V, 1890, p. 447.
Sphex habena Kohl, Ann. natur. Hofmus. Wien, X, 1895, p. 70.

Type.—Say's type was from Louisiana. It is no longer in existence. Cresson's type of *lauta* var. *illustris* is in the collection of the American Entomological Society in Philadelphia, where I have studied it with care.

Body everywhere black; legs black; pubescence golden; wings hyaline, tinged with yellow, their outer margins somewhat fuliginous; large, robust insects.

Female.—Head quite large, quadrangular, the eyes and cheeks being quite full; clypeus and frons to the ocelli densely pubescent and with many long, golden hairs, longer and stouter on the clypeus; front margin of the clypeus evenly, strongly rounded, with a hollow at the middle, from which arise a pair of broad, blunt teeth, separated by a notch; frons above the pubescence, the vertex and the cheeks, except where pubescent, sericeous black with a dark brownish tinge; distance between the lateral ocelli less than between them and the eyes; just behind the ocelli is a transverse-oval, slightly raised area; frons, vertex, and cheeks with scattered punctures and rather long, golden hairs, the latter being coarsest and longest on the lower part of the cheeks which at their middle are nearly as wide as the eyes; behind the middle of the eye is a rather triangular pubescent spot; inner margins of the eyes parallel; antennæ black, the scape with numerous short, yellow or golden hairs, particularly on the inner side; filament black sericeous, velvety; relative length of the filament segments $\frac{1}{33}$, $\frac{2}{20}$, $\frac{3}{19}$, $\frac{4}{19}$, $\frac{5}{17}$; mandibles black, stout, two-toothed, the terminal tooth extending beyond the base of the other mandible; their anterior surface with numerous slightly oblique striæ or aciculations; posterior edge with a

row of long, golden hairs; the edge and tip of the terminal tooth faintly tinged with ferruginous.

Thorax.—Collar not closely appressed against the mesonotum, its faces nearly vertical, the anterior one slightly oblique to the neck for a very short distance at its lower part; the anterior face and dorsal edge pubescent and with numerous long, golden hairs; neck black above in the middle, pubescent laterally; dorsal edge of the collar slightly flattened near the middle; its sides pubescent about half way down, then black; prothoracic lobe black in front, pubescent on its posterior half, with numerous yellow hairs; prosternum black, with a pubescent spot in front of each coxa; with quite numerous medium-sized punctures and hairs; mesonotum with a broad, pubescent band on each side, beginning just above the prothoracic lobe, passing up around the tegula, then backward to the posterior end of the plate where it turns inward, becoming narrower, and meets the band from the opposite side; the middle of the plate densely black, sericeous, almost concealing the anterior median groove, which appears to extend back about one-third the length of the plate; there are numerous short, erect golden hairs over the entire surface of the mesonotum; scutellum black sericeous, with a slight median groove visible at some angles; postscutellum densely pubescent; dorsum of the median segment densely pubescent and with many rather short, erect, golden hairs; fovea crescentic, rather narrow; posterior end from the fovea to the petiole covered by a large, squarish pubescent spot, its sides somewhat rounded; there is also a pubescent band along the side, against the stigmatal groove; between this and the posterior pubescent square, and on a narrow strip running inward above the square to the fovea the black surface of the plate is visible, its surface slightly roughened; posterior end and sides with quite numerous long, golden hairs; mesopleura with a small pubescent spot above and slightly in front of the coxæ and a large spot behind the prothoracic lobe, a portion of which extends forward in front of the lobe to the edge of the mesonotum in front of the tegulæ; the remainder black, with fine, scattered punctures and somewhat pale sericeous in places, and with numerous, long and short, golden hairs distributed over the entire pleura; metapleura with a pubescent band, its posterior half sometimes paler, running from the hind coxæ along the stigmatal groove and side of the dorsum to the postscutellum, wider in front; the rest of the plate pale sericeous, with quite numerous, fine punctures and golden hairs varying in length; mesosternum yellowish sericeous, and with many rather short, golden hairs; petiole black, straight, pale sericeous, and with numerous short, yellow hairs; but little more than half as long as the second hind tarsal segment.

Abdomen.—Rather broad and stout, rising upward quite sharply behind the petiole; about equally pointed at the ends; grayish seri-

ceous, particularly so except on the last three segments above; surface smooth, with a very few faint punctures on the fourth plate, located rather at the sides and behind; with more on the fifth, somewhat coarser and with a few short black hairs; sixth plate coarsely punctured everywhere except close to the hind margin at the sides, and with a number of quite long black or brownish-black hairs; hinder margin of the fifth plate very slightly, broadly acuminate; the last plate narrow, acuminate, the tip blunt and with its middle rather flattened; beneath smooth on the first three plates except for a minute puncture and short black hair here and there; the last three plates with punctures and hairs increasing in number and size going backward; the last plate quite generally punctured except on the middle line, though not as coarsely as the last dorsal plate; its outline conical, the hinder margin evenly rounded; with quite a number of long, black or brownish-black hairs.

Wings.—Yellowish hyaline to the outer ends of the cells; the outer margins slightly fuliginous; fore wing with the first transverse cubital vein bent a little into the second cubital cell; first recurrent vein almost interstitial with the second transverse cubital; second and third transverse cubital veins less than half as far apart on the radial vein as the second transverse cubital and second recurrent are on the cubital vein; hind wing with the transverse median vein slightly arched outward at its middle, making more than a right angle with the median; discoidal vein almost interstitial; only a trace of the cubital vein present beyond the transverse cubital, which is oblique to the other; veins brown; tegulæ brownish-black, very minutely punctured, with a pubescent spot near the middle.

Legs.—Everywhere pale (gray?) sericeous when viewed at certain angles; fore femora with a broad pubescent band behind and numerous short golden hairs; fore coxæ sericeous, almost pubescent in front; fore metatarsi with ten short comb teeth, not alternating with short spines; hind tibiæ heavily brown and gray sericeous behind; their inner contour slightly curved, hollowing in the middle; outer margins of the claws except the tips piceous; spines black.

Male.—Unknown.

Length.—Females, 26–28 mm.

Of this beautiful species only four specimens are known to me in any of the collections in this country. Say's original specimen was from Louisiana. The four now known were captured and are now located as follows: Cresson's type was taken in Texas and is in Philadelphia; the U. S. National Museum has a specimen marked "Miss. Agl. Coll. H. E. Weed.;" at the Museum of Comparative Zoology in Cambridge, Massachusetts, is a third specimen labeled "Dallas, Tex., Boll," and the fourth is in my own collection, captured in Alta Mira, Tamaulipas, Mexico, June 29, 1903.

It is possible that Cresson's suspicion that this insect will prove to be a subspecies of *lautum* may yet prove to be correct, in which case *habenum* Cresson will become the specific name, while *lautum* will become that of the subspecies with the red abdomen. This suspicion is still far from being proved, however.

It should be noted here that the insect identified by Cresson as *habena* Say, and going by this name in many collections, is quite different from the real *habenum* and does not agree with Say's description in many ways. It is really *C. spiniger* Kohl.

CHLORION (PROTEROSPHEX) TEPANECUM (Saussure).

Sphex tepanecus Saussure, Reise d. Novara, Hym., 1867, p. 41, pl. II, fig. 23.
Sphex mexicana Taschenberg, Zeits. f. d. ges. Naturw., XXXIV, 1869, p. 416.
Sphex tepaneca Cameron, Biol. Centr.-Amer., Hym., II, 1889, p. 33.
Sphex mexicana Cameron, Biol. Centr.-Amer., Hym., II, 1889, p. 34.
Sphex tepanecus Kohl, Ann. natur. Hofmus. Wien, V, 1890, p. 401.

Robust, black except on the basal half of the abdomen and on parts of the femora; wings hyaline with a strong yellowish tinge to the outer ends of the cells, the outer margins somewhat fuliginous; without pubescence except on the head.

Female.—Unknown.

Male.—Head quite broad, somewhat quadrangular from above, but with the cheeks retreating more from the corners of the quadrangle than do the eyes; entire clypeus and sides of the frons to above the antennæ covered with silvery pubescence, which is very smooth and satin-like on the clypeus, along whose sides are numerous long black hairs; its anterior margin rather rounded truncate, black, not reflexed; on the sides of the frons the black hairs are longer and more abundant, as well as along the middle line of this plate; the remainder black sericeous; lateral ocelli about equidistant from the eyes and from each other; vertex, occiput, and cheeks black sericeous, the last two with numerous long black hairs, particularly long and abundant below; inner borders of the eyes about parallel; antennæ black, the outer part rather brownish sericeous; scape with a brownish tinge at the outer end; the first segment of the filament black; relative length of the filament segments $\frac{1}{4\,5}$, $\frac{2}{2\,6}$, $\frac{3}{2\,6}$, $\frac{4}{2\,6}$; mandibles at base and on the teeth to their bases black; elsewhere ferruginous, with a few short longitudinal rows of striæ containing deeper punctures; two-toothed, the terminal tooth nearly reaching the base of the other mandible; with scattered long black hairs on the hinder face; head not as broad as the distance between the outer edges of the tegulæ.

Thorax.—Densely clothed with quite short, erect, black hairs; anterior face of the collar almost vertical, the posterior face closely appressed against the mesonotum; with many quite long, black hairs; dorsal edge of the collar somewhat flattened in the middle; prothoracic lobe with quite a thick fringe of short brown hairs behind; median

groove of the mesosternum partly concealed by the clothing, apparently rather broad and extending back about half the length of the plate; scutellum with a slight median groove not perceptible on the postscutellum; between these two plates, projecting forward from the latter, is a fringe of very short brown hairs; dorsum of the median segment well clothed with many black hairs of medium length; with a rather pronounced median depression, deepest about two-thirds the length of the plate from the front; fovea a rather elongated crescent; dorsum and posterior end of the median segment nearly at right angles; posterior end and sides thickly covered with long black hairs; pleura and sterna black, with long black hairs, except above the middle coxæ, where it is quite glabrous; petiole short, stout, straight; its length, as compared with the second and third hind tarsal segments, being 28–45–33.

Abdomen.—Large, stout, high, rising sharply from the petiole; its first, second, and all but the posterior margin of the third dorsal plate reddish ferruginous; the rest black, somewhat sericeous; the next to the last dorsal plate with quite numerous punctures and a few short, black hairs at the sides; the terminal plate with a rather large, shallow, median depression near its base; its posterior edge rounded, somewhat truncated in the middle, and its posterior half with numerous coarse punctures and black hairs beneath; the first two and the anterior corners of the next two plates reddish ferruginous, the others black; the surface not sericeous; with a few scattered punctures anteriorly, increasing in abundance posteriorly, and with a few short, black hairs on the sides of the more posterior plates; the terminal plate closely covered with short, erect, brownish and blackish hairs; its sides somewhat rounded, its end quite truncate; tips of the protruding genitalia ferruginous.

Wings.—Strongly yellow (reddish at the base) to the ends of the cells, the outer margins somewhat fuliginous; second recurrent vein of the fore wing joining the cubital vein in the second cubital cell near the second transverse cubital vein; the distance from the second transverse cubital vein to the third on the radial vein but little more than that from the former to the second recurrent vein on the cubital vein; the first transverse cubital vein bending somewhat into the second cubital cell; the cubital and subdiscoidal veins beyond the cells are fuliginous and there is a darker streak of the same beyond the end of the radial cell; the cubital vein of the hind wing continues nearly straight from the junction of the median and transverse median veins, the discoidal being not quite interstitial; the cubital vein is well developed beyond the transverse cubital, which joins it almost at a right angle, being itself only slightly curved; tegulæ black.

Legs.—Black, except the fore femora beneath, where they are ferruginous, and the middle femora beneath, where there is a trace of

the same color; fore femora much compressed laterally; spines of the legs black; the claws near their middle with a faint ferruginous tinge; inner contour of the hind tibiæ quite straight, their hind surface densely brownish sericeous; hind metatarsi considerably curved.

Variations.—This description has been prepared from the two specimen I have seen. Kohl's description differs in some regards, which are therefore given here as follows: Face clothed with white or yellow pubescence; inner margins of the eyes very slightly converging downward; lateral ocelli farther apart than they are from the eyes; petiole about as long as the second hind tarsal segment.

Length.—Males, 25–31 mm.

All the specimens of this species except one have been captured in Mexico, but I find no data as to the exact locality. This exception was taken in August, 1905, at Carr Canyon, Cochise County, Arizona, by Dr. Henry Skinner. Its most striking features seem to be the curve of the posterior metatarsi and the reddish color on the abdomen, this being quite reddish ferruginous, with (in the examples I have seen) a distinct carmine shade.

CHLORION (PROTEROSPHEX) FLAVITARSIS, new name.

?Sphex opaca DAHLBOM, Hym. Eur., 1, 1845, p. 437.
Sphex flavipes SMITH, Cat. Hym. Brit. Mus., IV, 1856, p. 263.
?Sphex tibialis SAUSSURE, Reise d. Novara, Hym., 1867, p. 39.
Sphex opaca TASCHENBERG, Zeits. f. d. ges. Naturw., XXXIV, 1869, p. 413.
Sphex flavipes PATTON, Proc. Bos. Soc. Nat. Hist., XX, 1880, p. 382.
Sphex flavipes KOHL, Ann. natur. Hofmus. Wien, V, 1890, p. 404.
Sphex flavipes H. FERNALD, Psyche, X, 1903, pp. 202–204.

Large, quite robust; the body black; outer portion of the legs rusty yellow; wings fuliginous with a slight violet reflection; hairs yellowish; pubescence yellow.

Female.—Head broad, black, covered with long, yellowish hairs; clypeus somewhat arched, its anterior edge rounded, with a slight notch in its middle separating two very short, rather blunt teeth; the surface of the clypeus yellow pubescent as is also that of the frons to above the insertion of the antennæ; vertex very minutely punctured and with scattered, larger punctures; cheeks narrow behind the eyes, about half the width of the eye, with long, coppery-yellow hairs, and yellow pubescent near the middle below; inner margins of the eyes about parallel; antennæ black, the scape with a few yellowish hairs and slightly yellowish pubescent inwardly and beneath; first segment of the filament the longest; mandibles long, two-toothed, black at the base and at the tip of the anterior and all of the terminal tooth, the remainder ferruginous.

Thorax.—Collar black, with scattering yellow hairs and a narrow, yellow, pubescent band on the dorsal edge; prothoracic lobe yellow pubescent, particularly behind; mesonotum covered with short, yel-

low hairs and with a pubescent band running from near the front of the tegulæ, on the edge of the plate, backward to its hinder margin, then inward along that margin till it barely meets the band from the other side; scutellum black, covered with short, pale yellowish hairs; with a hint of a pubescent band along its posterior edge; post scutellum narrow, covered with pubescence; median segment thickly clothed with long, yellowish hairs; with a large, squarish, yellow pubescent spot above the petiole, divided on the median line; sides of the thorax sparsely clothed with yellow hairs and with a pubescent spot on the mesopleuron just behind the prothoracic lobe, which extends upward to near the base of the fore wing; beneath rather more densely clothed than on the sides, with longer hairs; petiole short, straight, with pale yellow hairs and with a tendency toward pale yellow pubescence behind; sometimes the dorsum of the median segment shows faint transverse aciculations.

Abdomen.—Black, very finely sericeous, the last four dorsal plates coarsely punctured on each side of the middle line; the last two with dark yellow hairs; beneath with scattered punctures and long, dark yellow hairs, particularly on the last two plates.

Wings.—Fuliginous with a slight violet reflection; the hind wing with the cubital vein bending sharply forward beyond its junction with the discoidal, which is not interstitial, and giving off (in all specimens I have seen) a short vein bending back into the median cell; becoming a mere deeper shade beyond the transverse cubital vein; the transverse median vein straight, making more than a right angle with the median vein; tegulæ partly black, partly dull ferruginous, with slight yellow pubescence on the anterior portion.

Legs.—Coxæ, trochanters, and varying portions of the femora black; the remainder of the legs rusty yellow, the claws darker, their tips black; spines the color of the legs or a little darker; coxæ, trochanters and femora more or less sericeous, the coxæ with a few pale hairs; inner contour of the hind tibia straight, the posterior surface strongly pale brownish sericeous; fore metatarsus with nine or ten comb teeth alternating more or less with short spines.

Male.—Differs from the female in being generally more thickly pubescent and hairy; the last dorsal abdominal plate is narrow from front to rear and its posterior margin is somewhat emarginate its whole width; beneath, the last plate broadly, bluntly rounded, with a short, acuminate point in the middle and a median ridge extending to the anterior margin, across the plate; the anterior margin of the clypeus is rounded, slightly emarginate in the middle, and without teeth.

Length.—Females, 24–32 mm.; males, 22–32 mm.

This species, which is not common, has been captured in Georgia, Mississippi, and Texas, according to the data on the specimens I have

seen. The subspecies *saussurei* occurs in Mexico, from which country I have also seen an example of the subspecies *iheringii*, which is more common in South America. The subspecies *guatemalensis*, though first taken in Guatemala, has also been found in Mexico.

A figure of this insect is given in the Insect Book (Plate XI, fig. 8.)

CHLORION (PROTEROSPHEX) FLAVITARSIS SAUSSUREI, new name.

‖ *Sphex hirsutus* SAUSSURE, Reise d. Novara, Hym., 1867, p. 40.
Sphex hirsuta CAMERON, Biol. Centr.-Amer., Hym., II, 1888, p. 31, pl. III, figs. 3,3a.
Sphex flavipes var. *hirsutus* KOHL, Ann. natur. Hofmus. Wien, V, 1890, p. 405.

This subspecies differs from the typical form just described by the color of the wings, which are hyaline with a strong yellow tinge and only slightly fuliginous beyond the ends of the cells. The pubescence is more abundant, the body more hairy, there is no short vein entering the median cell of the hind wing from the cubital vein in the specimens I have seen, and the average size seems to be somewhat greater, the females ranging from 29 to 32 mm., and the males from 26 to 30 mm. in length.

This subspecies occurs in Mexico, but I have no closer data of localities.

CHLORION (PROTEROSPHEX) FLAVITARSIS GUATEMALENSIS (Cameron).

Sphex guatemalensis CAMERON, Biol. Centr.-Amer., Hym., II, 1888, p. 32, pl. III, figs. 4, 4a.
Sphex flavipes var. *guatemalensis* KOHL, Ann. natur. Hofmus. Wien, V, 1890, p. 405.

This subspecies differs from the typical form in the following regards: The abdomen is partly ferruginous, varying in amount; the wings are quite hyaline, though with the outer margins slightly fuliginous and the inner portion tinged somewhat with yellowish, the veins dark; the pubescence and hairs, though golden, are rather pale, particularly the latter, and the outer half of the femur is ferruginous. The size is about that of average examples of the typical form.

Though first described from Guatemala, I have seen a male which was taken at Tuxpan, Jalisco, Mexico; September 3 (1902?).

CHLORION (PROTEROSPHEX) FLAVITARSIS IHERINGII (Kohl).

Sphex flavipes var. *iheringii* KOHL, Ann. natur. Hofmus. Wien, V, 1890, p. 405.
Sphex flavipes var. *iheringii* FOX, Proc. Acad. Nat. Sci. Phila., 1897, p. 377.

In this subspecies the abdomen is black; the coxæ, trochanters and a little of the base of the femora black, also the tips, inner margins, and teeth of the claws; the tips of the hind tibiæ and all of the hind tarsi are black, the spines ferruginous; the wings are strongly fuliginous, with a pronounced violet to blue reflection; the pubescence

and hairs are golden in front, but become paler behind; in one specimen seen there is a trace of the vein entering the median cell of the hind wing from the cubital vein. The size is about that of the typical form or perhaps a little less.

The habitat of this subspecies is now extended northward from Argentina and Brazil, from which countries it has already been recorded, by the discovery of a specimen in the collection of the American Entomological Society from Mexico, the exact locality not given.

CHLORION (PROTEROSPHEX) NUDUM (H. Fernald).

Sphex nudus H. FERNALD, Psyche, X, 1903, p. 201.

Types.—Described from six male specimens. These cotypes are now one each in the collections of the U. S. National Museum, American Entomological Society, and the Massachusetts Agricultural College, Amherst, Massachusetts, and three in the collection of their captor, Mr. J. C. Bridwell.

Insects of medium size; body black; legs beyond and including the outer ends of the femora yellow ferruginous except the last tarsal segment and claws, these and the proximal leg segments being black; pubescence pale straw color, almost silvery; hairs yellowish-white; wings nearly hyaline, the front pair slightly brownish.

Female.—Unknown; probably *Chlorion* (*Proterosphex*) *bridwelli* H. Fernald.

Male.—Head black, covered with long, yellowish-white hairs; clypeus somewhat arched laterally, its anterior margin rounded at the sides, transverse or even slightly emarginate in front, not reflexed, its surface quite thickly covered with pale straw pubescence and with many quite long, yellowish-white hairs; frons similarly clothed with pubescence and hairs to about the level of the insertion of the antennæ, and above them at the sides, with a rather scattered tuft of long hairs on the middle line just above the antennæ; frontal suture perceptible for a short distance below the median ocellus; the upper part of the frons blackish sericeous, dull; vertex and cheeks rather finely punctured and bearing quite long, whitish hairs, longer and closer on the lower part of the cheeks, which are nowhere half the width of the eye, and which retreat sharply toward the neck, making the outline of the head as seen from above quite oval; antennæ black, the scape with short, pale straw-colored hairs; the first segment of the filament longest; mandibles black at base and from the bases of the teeth to their tips; elsewhere ferruginous.

Thorax.—Collar with faint, scattered punctures and a few pale hairs and with a trace of yellowish-white pubescence on its dorsal edge; its anterior face rising sharply from the neck; its posterior face somewhat closely appressed against the mesonotum; prothoracic lobe black,

its posterior portion somewhat pubescent, fringed behind with short, pale hairs; mesonotum somewhat punctured, with short, grayish-white hairs, and a faint median longitudinal groove on its anterior third; scutellum rather more sparsely and finely punctured, with a slight median depression, and covered with short, grayish-white hairs; postscutellum pale yellowish-white, pubescent as far laterally as the groove at the side of the dorsum of the median segment, this pubescence often being in part or entirely absent; dorsum of the median segment finely, transversely aciculate, covered with yellowish-white hairs longer than those of the mesonotum and scutellum; above the petiole are two yellowish-white pubescent areas partly confluent on the middle line; petiole short, straight, black, with yellowish-white hairs.

Abdomen.—Above, smooth, gray sericeous, very faintly punctured, the last two plates bearing grayish and brownish hairs directed backward; the terminal plate rounded, somewhat compressed on its posterior half at the sides, forming a slight median ridge; beneath, glistening, somewhat sericeous, with a few scattered grayish hairs, which on the fourth, fifth, and sixth ventral plates become tufts, one on each side, on each plate; seventh plate somewhat emarginate on its posterior margin; terminal plate rounded at the sides, acuminate at the middle, behind, giving the plate the same form as that found in *C. flavitarsis*.

Wings.—Nearly hyaline, the front pair very slightly fuliginous; end of the radial cell rather squarely rounded; cubital vein a mere shadow beyond the ends of the cells; transverse median vein making more than a right angle with the median vein in the hind wing; the cubital vein only a faint shade beyond the transverse cubital; tegulæ black, the margin more or less ferruginous; pale sericeous near its center.

Legs.—Coxæ, trochanters, greater portion of the femora, last tarsal segment and claws black or very dark; the rest of the leg and the tips of the claws and the spines yellow ferruginous; coxæ sparsely punctured, sericeous, with a few scattered hairs.

Length.—Males, 18–22 mm.

I have studied specimens of this species from Tennessee, Georgia, and Maryland. Most of the specimens known were captured August 23, 1902, at Indian Head, Maryland, by Mr. J. C. Bridwell on the flowers of *Monarda punctata* Linnæus in company with *C. bridwelli* H. Fernald, and I am of the opinion that these two will ultimately prove to be the two sexes of the same species. The yellow legs and general appearance of *C. nudum* are so suggestive of *C. flavitarsis* that it is probable that specimens of the former species are in many collections under the latter name.

CHLORION (PROTEROSPHEX) BRIDWELLI (H. Fernald).

Sphex bridwelli H. Fernald, Psyche, X, 1903, p. 202.

Types.—Six females, one each in the collections of the U. S. National Museum (Type, Cat. No. 9907 U.S.N.M.), the American Entomological Society, and the Massachusetts Agricultural College in Amherst, Massachusetts, and three in the collection of J. C. Bridwell, their captor.

Insects of medium size; body black and glistening; legs black to near the ends of the femora, the tibiæ and tarsi, except the last segment of the latter, yellow ferruginous; wings strongly fuliginous, with a blue or violet reflection.

Female.—Head somewhat quadrangular with rounded corners when viewed from above; with scattered dark and yellowish hairs; clypeus arched, its anterior margin reflexed, rounded, with a small central notch and the part of the margin nearest the notch projecting a little beyond the general line of curvature; the surface of the clypeus with traces of golden pubescence at the sides, and with scattered, coarse punctures, many very minute ones, and long, yellowish-brown hairs; frons sparsely punctured, golden pubescent at the sides to above the bases of the antennæ, and bearing numerous pale and dark hairs; frontal suture evident; ocelli located in a triangle marked by impressed lines, the lateral ocelli slightly nearer each other than they are to the eyes; vertex very minutely punctured and also sparsely, more coarsely so, bearing scattered, dark hairs; cheeks rather more than half the width of the eye, narrowing quickly below, with numerous fine and a few coarse punctures and scattered hairs, longer and coarser below; inner margins of the eyes parallel; antennæ black except the outer part of the scape which is more or less dull ferruginous brown beneath and bears a few dark hairs; first segment of the filament longest; the outer half of the filament a little grayish; mandibles with their teeth and base black, the rest a rather pale ferruginous; with scattered aciculations and hairs on the anterior face and a row of long hairs on the outer margin.

Thorax.—Collar very flat laterally on its anterior face, rising sharply, almost at right angles to the neck, its dorsal edge narrow, quite evenly rounded, its posterior face vertical, somewhat closely appressed to the mesonotum; its surface minutely punctured and bearing long, dark and pale hairs; its sides rather glistening; prothoracic lobe with a thick fringe of pale brown hairs on its posterior margin; mesonotum quite evenly covered with punctures of medium size and very many minute ones; with a rather broad, anterior, median groove extending back nearly half the length of the plate; the sides of the plate with a slightly reflexed margin extending from the front of the tegulæ to the hinder margin; with a few short, scattered, erect hairs; scutellum quite

large, with a distinct median depression, punctured like the mesonotum but a little more sparsely; postscutellum faintly punctured, rather more hairy than the scutellum, with a faint median depression; dorsum of the median segment very finely transversely aciculate, thickly clothed with short, erect, whitish hairs, which do not conceal the plate beneath; fovea crescentic, at the angle between the dorsum and posterior end, which is rounded, but, as a whole, nearly a right angle; posterior end and sides quite closely covered with long, whitish hairs and sometimes with a small, pale yellowish pubescent spot on each side, just above the petiole; meso- and metapleura rather sparsely, not very coarsely punctured and bearing scattered whitish hairs; petiole black, short, straight, with a few whitish hairs.

Abdomen.—Somewhat sericeous above, particularly on the anterior segments, smooth except the last two plates, which are coarsely punctured and bear short, brownish hairs, the punctures being more abundant on the hinder plate; beneath glistening, with extremely minute punctures, and here and there a larger one anteriorly, these becoming more abundant posteriorly till they are quite abundant on the last two plates; this distribution of punctures coincides with that of the short, brown hairs also present.

Wings.—Uniformly fuliginous, with a blue or violet reflection; cubital vein of both pairs of wings obsolete beyond the ends of the cells; transverse median vein of the hind wing somewhat curved, making hardly more than a right angle with the median vein; tegulæ dull ferruginous, more or less mingled with darker.

Legs.—Coxæ, trochanters, and the greater part of the femora black; the outer ends of the femora, the tibiæ, and the tarsi, except the last segment, yellow ferruginous; last tarsal segment and claws dark or black; spines yellow ferruginous; coxæ, trochanters, and femora slightly sericeous in places and with short, scattered hairs.

Length.—Females, 22–25 mm.

The specimens of this species which I have seen were taken, one June 20, 1883, at New Orleans, Louisiana; one in Georgia; one had no data, and the others were taken August 23, 1902, at Indian Head, Maryland, on the flowers of *Monarda punctata* Linnæus.

This insect is easily confused with females of *Chlorion flavitarsis*, but may be separated from it by the almost or entire absence of pubescence and of any short vein entering the median cell of the hind wing from the cubital vein just beyond the junction of the latter with the discoidal vein, both of these characters being present in *C. flavitarsis* and absent in *C. bridwelli*.

CHLORION (PROTEROSPHEX) RESINIPES, new name.

‖*Sphex rufipes* LEPELETIER, Hist. Nat. Ins. Hym., III, 1845, p. 343.

Medium sized insects; the head, thorax and petiole black; abdomen, legs (except the coxæ) and tegulæ deep ferruginous or resin colored; wings hyaline with a yellow tinge, but also somewhat fuliginous with a violet reflection.

Female.—Head broad but hardly quadrangular, the cheeks retreating too quickly, though the eyes are quite full; clypeus black, its anterior margin and a median extension backward therefrom being more or less ferruginous; rather sparsely covered with yellowish-white pubescence and numerous long, yellowish hairs, the outer ends of which are blackish; the anterior margin of the clypeus somewhat reflexed, the portion beneath the eyes bare, smooth; the front margin quite evenly rounded, with two small, rounded lobes at the middle just above which is a slight depression or fovea; frons pubescent like the clypeus nearly to the ocelli, and with whitish hairs, shorter than those on the clypeus; this plate above the pubescence, the vertex, occiput and cheeks, black, somewhat sericeous; distance between the lateral ocelli less than from them to the eyes; vertex and occiput with fairly numerous, long, whitish hairs and a few longer, black ones; cheeks with a small, whitish, sparsely pubescent area behind the middle of the eye, becoming merely whitish-sericeous above and below; with numerous whitish and yellowish hairs, closer together and longer below; the cheeks broadest about one-third of their length below the top of the head; narrowing rapidly below, about two-thirds the width of the eye at their widest point; antennæ black, the scape ferruginous beneath, with a few short, pale hairs; outer part of the filament somewhat sericeous; relative lengths of the filament segments $\frac{1}{30}$-$\frac{1}{33}$, $\frac{2}{19}$, $\frac{3}{19}$, $\frac{4}{19}$; mandibles rather stout, each not quite reaching to the base of the other, two-toothed, the teeth black nearly to their bases, the remainder ferruginous with a blackish tinge at the basal articulation; the anterior face with a number of irregular punctures, the inner edge with a few long, ferruginous and black hairs, and the outer edge with a sparse fringe of similar ones.

Thorax.—Anterior face of the collar rising sharply about at right angles to the neck, partly whitish sericeous and with quite long, whitish hairs; the dorsal edge silvery pubescent, only very slightly flattened in the middle; the posterior face closely appressed against the mesonotum; the side in front of the prothoracic lobe quite smooth, somewhat glistening; prothoracic lobe bare in front, rather sparsely pale yellowish-white pubescent behind and with its hinder margin densely fringed with short, dirty yellow hairs; lateral suture of the neck fringed with very short, gray hairs; mesonotum with a white-pubescent, rather narrow band, beginning above and slightly behind the front

edge of the tegula on each side and running backward, then bending inward on the posterior margin to meet the band from the other side; at some angles this band is lost to sight except for a spot above the tegula; the rest of the plate closely, rather coarsely punctured and with many very short, erect, dirty white hairs; the anterior median groove rather broad and flat, its edges rather sharper behind, the groove faint in front, fading into the general surface of the plate behind, about one-third the length of the plate; scutellum slightly sericeous, with a very slight median groove behind, more sparsely and finely punctured than the mesonotum, with many very short, erect, whitish hairs; postscutellum silvery pubescent as far toward the sides as the groove at the side of the dorsum of the median segment, bearing numerous very short, erect, white hairs; dorsum of the median segment finely transversely aciculate in front, rather obliquely so behind, somewhat arched along the middle line except behind, where it is slightly hollowed; quite thickly covered with short, erect, whitish hairs; fovea a rather shallow, elongated crescent; posterior end of the median segment making quite an angle with the dorsum, but less than a right angle; with sparse silvery pubescence on each side of the middle which is not concealed and shows scattered, rather fine elevations; sides above with aciculations continued from the dorsum, becoming lost below, where the surface is roughened by scattered, small elevations, this condition extending down to the stigmatal groove; the end and sides of the median segment rather sparsely covered with long, white hairs; mesopleura with a small, silvery pubescent spot behind and a little below the prothoracic lobe; the remainder black, with fine, rather close punctures above, becoming coarser below; mesosternum and the lower part of the mesopleura whitish sericeous, almost pubescent and with many long, white hairs, which are also present in less numbers above; metapleura with a sparse and sometimes interrupted band of silvery pubescence along the stigmatal groove, and a spot of similar pubescence on the metapleural lobe just beneath the base of the hind wing, the rest of the plate being black, sparsely, finely punctured, and with long, whitish hairs, more abundant at and near the pubescent areas; from the hind coxæ to the middle pair on the side is a whitish-sericeous, broad band; petiole black, straight, with short, whitish hairs and a trace of whitish sericeous in some lights; its length compared with that of the second hind tarsal and first filament segments—22: 28: (30 to 33).

Abdomen.—Deep ferruginous or resin color, varied with somewhat darker, glistening, rather pointed at both ends; first dorsal plate not rising very abruptly or very high from the petiole, slightly yellowish-sericeous; the surface of the dorsal plates with scattered punctures, larger and more abundant posteriorly, the last two plates very noticeably so and bearing short, ferruginous hairs, longer on the last plate;

next to the last plate very slightly emarginate behind; terminal plate with its hinder margin broadly acuminate, the tip itself rounded, and with a faint median ridge extending forward a short distance. Beneath slightly paler than above, with rather coarser and more generally distributed punctures, and a few scattered hairs, most abundant on the last two plates; the last plate rather broad and evenly rounded behind, possibly very slightly emarginate at the middle.

Wings.—Hyaline, tinged with yellowish, the outer margins somewhat fuliginous, particularly beyond the end of the radial cell; everywhere with a violet reflection; the veins ferruginous-brown to brown. Fore wing with the first recurrent vein joining the second cubital cell about two-thirds of the distance from the first to the second transverse cubital veins; the second and third transverse cubital veins about half the distance apart on the radial vein that the second transverse cubital and second recurrent veins are on the cubital vein; transverse median vein of the hind wing almost straight, making about a right angle with the median vein; discoidal vein nearly or quite interstitial; the cubital vein bending slightly forward before running outward, joining the transverse cubital quite obliquely and becoming obsolete beyond that point; tegulæ ferruginous, darker behind, with a slight yellow or golden pubescent spot near the middle.

Legs.—Coxæ and more or less of the bases of the trochanters black, also the tips, inner edges and teeth of the claws; the remainder of the legs reddish ferruginous, as are the hairs and spines; fore femora somewhat hairy, particularly beneath; fore tibiæ coarsely yellowish sericeous in front; fore metatarsi with nine long comb teeth, the first one about half the length of the others, alternating with short spines; inner contour of hind tibia straight; its hind surface coarsely yellow sericeous; tarsi of all the legs more or less yellowish sericeous.

Length.—Females, 21–23 mm.

Males.—Unknown.

I have seen about a dozen specimens of this striking species in the collection of the American Entomological Society, all females, and all from Costa Rica, Cuba, and Santo Domingo. As they agree with Lepeletier's description and come from the same region there seems to be little room to doubt their identity and we may consider Lepeletier's species as having now been rediscovered. Unfortunately the name selected by that author was preoccupied, so it has been necessary to assign it a new name. The rich color of the abdomen and legs, somewhat resembling that of *Chlorion ichneumoneum fulviventris*, but richer, contrasting with its silvery pubescence, makes this an extremely beautiful species.

CHLORION (PROTEROSPHEX) ASHMEADI, new species.

Type.—Described from six female and five male cotypes. Three male and four female cotypes are now in the collection of the American Entomological Society; one male and one female are in the collection of the U. S. National Museum (Type, Cat. No. 9858, U.S.N.M.), and the remaining male and female are in the collection of the Massachusetts Agricultural College.

Medium-sized insects with black head and thorax; abdomen pale ferruginous to yellowish; petiole black or ferruginous; legs, except the coxæ, trochanters and tips of the claws ferruginous yellow; wings hyaline, with a yellow tinge in the females, rather fuliginous in the males; pubescence pale golden to silvery, mainly the latter.

Female.—Head rather broad (not as broad as the distance between the outer margins of the tegulæ), rather oval in outline when viewed from above; clypeus slightly arched, with scattered punctures and sparse pale golden to silvery pubescence, which extends upward on the frons to above the antennæ; the anterior margin of the clypeus quite evenly rounded across the front, with no teeth or irregularities, but sometimes faintly tinged with ferruginous; the surface well provided with long black hairs; frons sparsely punctured above the pubescence and bearing numerous black hairs, shorter and smaller than those on the clypeus; vertex minutely punctured, with a transverse crest between the posterior margins of the eyes; the vertex and cheeks faintly sericeous in certain lights; cheeks retreating quite sharply, not more than half the width of the eyes, sparsely, minutely punctured above, more thickly punctured below, where there are numerous long, black hairs; inner margins of the eyes parallel; antennæ black, the scape more or less dull ferruginous beneath, minutely punctured; relative lengths of the filament segments $\frac{1}{3^0}$, $\frac{2}{2^0}$, $\frac{3}{1^8}$, $\frac{4}{1^8}$; mandibles two-toothed, ferruginous except from the bases of the teeth to their tips, where they are black; somewhat aciculated in front and beneath on the ferruginous portion; with a few long, pale ferruginous hairs near the base of the inner border, pointing toward the anterior tooth, and a fringe of similarly colored hairs on the outer border pointing backward.

Thorax.—Black, without pubescence; anterior face of the collar not rising very sharply from the neck, somewhat rounded laterally, its surface with fine scattered punctures and black hairs; the dorsal edge rather flattened near the middle line; the posterior face not closely appressed against the mesonotum, nearly vertical; side of the collar in front of the prothoracic lobe smooth, glistening; prothoracic lobe black, glistening, moderately punctured, with numerous black hairs of medium length and a dense fringe of pale brown, short hairs on the posterior margin; mesonotum quite closely, rather weakly punctured,

with short, black hairs and here and there a trace of silvery sericeous; its lateral and posterior margins from the prothoracic lobe to where the scutellum reaches the height of the mesonotum behind, somewhat reflexed; anterior median groove slight, broad; scutellum less closely punctured, glistening, with a slight median groove, particularly behind; somewhat whitish-sericeous; postscutellum rather more closely punctured; with a very slight median groove and with a few short hairs; median segment everywhere dull black; finely, closely punctured; thickly covered with short, whitish hairs, which at the sides and behind become much longer and brownish in part; petiole pale, almost yellow ferruginous, short, straight, with numerous pale yellowish hairs; its length compared with that of the second hind tarsal segment and first filament segment, 30: 35: 35; meso and metapleura finely, not densely, punctured and with numerous black hairs of varying length; that portion of the mesopleuron nearest the base of the fore wing is sometimes dull ferruginous; at different places on the pleura are silvery sericeous areas, visible only at certain angles; sterna with the same type of punctures, hairs and sericeous areas as the pleura.

Abdomen.—Pale yellowish ferruginous, except for a few dark spots varying in form and location in different specimens or absent in some cases; rather long, pointed behind, rather broad in front; the surface above pale sericeous, smooth except for small punctures, few anteriorly where they are at the sides, but increasing posteriorly and encroaching more on the dorsal region; they are first very noticeable on the fourth plate, become coarser and more abundant on the fifth, and are very prominent on the terminal plate where are also a few pale yellow hairs pointing backward; the hinder margin of this plate is broadly rounded, with a slight blunt median projection; beneath the color is the same as above, sometimes with irregular darker markings here and there; there are a few scattered coarse punctures on each plate, chiefly a little lateral to the median line, and occasional quite long pale yellowish hairs.

Wings.—Hyaline, with a strong yellow tinge, particularly toward the base; faintly fuliginous on the outer border; second and third transverse cubital veins of the fore wing about half as far apart on the radial as on the cubital vein; transverse median vein of the hind wing straight, joining the median at more than a right angle; cubital vein well developed beyond the transverse cubital; tegulæ yellow, glistening, with a few scattered slight punctures.

Legs.—Coxæ and trochanters black, the latter with a reddish brown tinge, with scattered punctures and short dark hairs; the coxæ showing a tendency to be sericeous in places; the other segments of all the legs ferruginous yellow, as are their spines; inner edges of the claws, their tips and teeth, black; posterior tibiæ yellow sericeous behind, their inner contour straight; fore metatarsal comb with ten (some-

times eleven) comb teeth, the last one or two very stout; their length about half that of the metatarsus.

Male.—Differs as follows: The scape is less evidently ferruginous beneath; traces of silvery pubescence are present on the end of the median segment above the petiole; mesopleuron at the base of the fore wing black; petiole black, sometimes faintly tinged with ferruginous; abdomen quite whitish-sericeous, this increasing posteriorly and being very pronounced and coarse on the last three segments; posterior margin of the last dorsal plate evenly rounded; clypeus with a slight depression on the median line anterior to the middle; seventh ventral abdominal plate slightly, broadly emarginate, the eighth less broadly but more deeply so; the terminal plate quite strongly rounded at the sides, acuminate in the middle behind and with a slight ridge along the middle; wings quite uniformly fuliginous and with a slight violet reflection, but still with a yellowish tinge in some cases; femora partly—the posterior pair mostly—black; the last tarsal segments generally darker than the others, the tips of which are their darkest portions.

Variations.—In some specimens variations from these characters have been observed. In one case the pubescence on the clypeus and frons was golden below, becoming silvery above, and it extended well above the antennæ; the anterior face of the collar was strongly sericeous; the scape was nearly all ferruginous; traces of a lateral mesonotal pubescent band, silvery white in color were seen; the dorsum of the median segment was closely covered with short dull yellow erect hairs and the posterior end of the segment was dull yellow pubescent; the hinder part of the prothoracic lobe, a vertical streak behind it and a spot or streak above the middle coxæ were yellowish-white pubescent. One female had a black petiole, the last three abdominal segments black and the others so dark as to seem dark reddish brown. Other specimens show one or another of these variations.

Length.—Females, 21–27 mm.; males, 19–25 mm.

This species appears to have a somewhat restricted habitat. The specimens seen all came from Texas, New Mexico, Arizona, and Colorado, the records being: "Tex.; "Col.; " Florence, Arizona, August 23, 1902, and April 20, 1903; Congress Junction (July), and Bill Williams Fork (August), Arizona; Las Cruces, New Mexico; Alamogordo, New Mexico (VI, 7, '02); and Yuma County, Arizona, September, 1903.

In some respects this species resembles *Chlorion ruficaudum* (Dahlbom), but differs from it in not having its tibiæ enlarged near the end, and in having partly yellow legs and in the practical absence of pubescence.

CHLORION (PROTEROSPHEX) SPINIGER (Kohl).

?Sphex dorsalis LEPELETIER, Hist. Nat. Ins. Hym., III, 1845, p. 347, male.
Sphex habena CRESSON, Trans. Am. Ent. Soc., IV, 1872, p. 211 (misidentification).
?Sphex singularis CAMERON, Biol. Centr.-Amer., Hym., II, 1889, p. 33, pl. III, figs. 7, 7*a*.
Sphex spiniger KOHL, Ann. natur. Hofmus. Wien, V, 1890, p. 428.

Rather small insects; body black, sometimes with more or less ferruginous; legs the same; pubescence silvery to golden; hairs yellowish to gray.

Female.—Unknown; see remarks below, and after *Chlorion dubitatum*.

Male.—Head black, rather broad; clypeus and frons to above the antennæ covered with golden pubescence and long, golden hairs; anterior margin of the clypeus rather truncate, without teeth or projections; vertex and cheeks with numerous long, pale golden hairs; distance between the lateral ocelli greater than from them to the eyes; cheeks about half the width of the eyes, with traces of golden or paler pubescence below; inner margins of the eyes somewhat converging downward; antennæ black, the scape quite thickly clothed within and below with short, yellow hairs and with a trace of pubescence; the first segment of the filament longest; mandibles black, very faintly ferruginous near the bases of the teeth, rather slender, somewhat aciculated beneath, and with a few yellowish hairs on the posterior face.

Thorax.—Collar sparsely covered with whitish hairs, silvery pubescent on its dorsal edge and with traces of pubescence at the side below; not closely appressed against the mesonotum; its front and rear faces nearly vertical; with a slight but noticeable median depressed line in front; prothoracic lobe with scattered punctures anteriorly; with pale yellowish, almost silvery pubescence posteriorly; mesonotum with a pale yellow or whitish pubescent band on each side, beginning about opposite the anterior edge of the tegula and running backward along the margin of the plate to its posterior end, then turning inward but not usually meeting the band from the other side; the rest of the mesonotum closely, rather minutely, punctured; the anterior median groove rather deep; the entire plate quite thickly covered with pale yellowish hairs not as long as those of the head but obscuring the pubescence; scutellum black, with numerous fine punctures, a slight median groove, and covered with yellowish-white hairs, shorter and less noticeable than those of the mesonotum; postscutellum covered with silvery pubescence and long hairs; median segment thickly clothed with pale yellowish hairs, shortest on the dorsum, which is faintly rugose in places, almost irregularly transversely aciculate; the dorsum has a very slight depression anterior to the fovea; posterior end of the median segment with a pair of silvery pubescent spots, confluent on the middle line, the surface between these and the stigmatal groove

roughened by the presence of many small elevations; meso- and metapleura with long, yellowish-white hairs; a spot behind the prothoracic lobe is pale yellowish pubescent, and there is a silvery pubescent band on the metapleuron from the hind coxæ along the stigmatal groove; the general surface of the mesopleuron is rather roughened; mesosternum quite thickly covered with long, yellowish hairs and sometimes partly pale yellowish pubescent; petiole short, straight, black, quite thickly clothed with long, pale yellow hairs, and with traces of yellowish sericeous in some ca es.

Abdomen.—Black, sometimes more or less ferruginous; yellowish sericeous, particularly anteriorly; above, the last four plates bear short, dull yellow hairs pointing backward, most abundant at the sides in front, but everywhere on the last plate; posterior margin of the last plate rounded, with a slight notch or only an emargination in the middle; beneath glistening, smooth, with a few scattered hairs, particularly at the sides, on the hinder plates; posterior margin of the seventh plate forming a deep, broad notch, with a tuft of dark yellowish hairs on each posterior angle and a short, nearly erect, sharp-pointed spine in the middle near the base of the segment, often concealed by the sixth plate, which may cover it from sight; terminal plate triangular, rather narrow at the base, forming a point behind, from which a pronounced ridge runs forward in the middle of the plate to its base.

Wings.—Hyaline, slightly fuliginous along their outer margins or rarely somewhat fuliginous everywhere; with a noticeable darker shade beyond the end of the radial cell; cubital vein of the fore wing obsolete beyond the end of the third cubital cell; transverse median vein of the hind wing quite straight, making more than a right angle with the median; discoidal vein not interstitial; cubital vein with a no iceable backward bend near its middle, obsolete beyond the transverse cubital vein; the radial runs but a short distance beyond this point also; tegulæ black with a ferruginous tinge behind, very faintly sericeous in front, quite smooth.

Legs.—Black, sometimes more or less ferruginous, the distribution of the color being irregular; anterior coxæ yellowish pubescent in front; all the coxæ thickly covered with long, yellowish hair, thickest and longest on the front pair; trochanters black, with more or less of yellowish hairs; anterior and middle femora quite hairy, the posterior pair smooth; tibiæ and tarsi yellowish sericeous, the spines on the anterior and middle pairs yellow, those on the posterior pair all or in part black; claws black.

Variations.—Differences in the amount of ferruginous on the abdomen and legs, and in the depth of color of the pubescence and hairs give to different specimens of this species quite different general appear-

ances, particularly when examples from the southern United States and from the West Indies are compared.

Length.—Males, 17–20 mm.

It is possible that this insect may prove to be the *Sphex dorsalis* of Lepeletier, but if so Lepeletier's description must have been made from one of the more ferruginous specimens. Several collections in this country have examples of *C. spiniger* labeled *Sphex habena* Say. This error is due to the misidentification of the specimens by Cresson. Cameron's description of *Sphex singularis* may perhaps be of this insect, but the absence of some points from his description prevent any positive conclusions being reached.

I have studied examples of *Chlorion spiniger* from Florida, Louisiana, Mississippi, Texas, Santo Domingo, Barbados, Dominica, and Trinidad. Kohl records it from Mexico and Brazil. In quite a large lot of specimens of *Chlorion* from the above-named West Indian Islands all the males were *spiniger* and all the females *dubitatum* which is rather suggestive of a relation between these species and which is considered under *dubitatum*.

CHLORION (PROTEROSPHEX) DUBITATUM (Cresson).

‖*?Sphex dorsalis* Smith, Cat. Hym. Brit. Mus., IV, 1856, p. 259.
‖*Sphex micans* Taschenberg, Zeits. f. d. ges. Naturw., XXXIV, 1869, p. 419.
Sphex dubitata Cresson, Trans. Am. Ent. Soc., IV, 1872, p. 213.
Sphex ichneumonea Cameron, Biol. Centr.-Amer., Hym., II, 1889, p. 34.
Sphex ichneumoneus var. *dorsalis* Kohl, Ann. natur. Hofmus. Wien, V, 1890, p. 431.
Sphex dubitatus Fox, Proc. Acad. Nat. Sci. Phila., 1897, p. 377.

Type.—Cresson described *Sphex dubitata* from three females in the Belfrage collection. In the collection of the American Entomological Society are three specimens marked "Type," one of which bears the following label in Cresson's handwriting:

S. = ich. var dorsalis
dubitata
Cr.
♀ of *habena?* Say.

In the National Museum is a female marked "Texas Belfrage. Type No. 1686." Which one of these four is not entitled to cotype value I am unable to say.

Rather small, slender insects; body, to and including the petiole, black; abdomen black and ferruginous, as are the legs; wings generally quite hyaline, sometimes more or less fuliginous; pubescence golden to silvery.

Female.—Head quite broad; clypeus and frons pale golden pubescent nearly to the level of the ocelli and with numerous long hairs of the same color; anterior margin of the frons evenly rounded, with two

short, blunt lobes at the middle, separated by a slight notch; head above the pubescence sparsely, rather finely punctured and bearing long, slender hairs; behind the ocelli is a slightly elevated, transverse-oval, velvety area; occiput and cheeks minutely, closely punctured and with long, yellowish hairs; cheeks pale golden pubescent close behind the eyes, beginning just below the top of each eye; with long, pale yellow hairs more abundant below; inner margins of the eyes very slightly converging downward; antennæ black; scape strongly sericeous, almost pubescent, with numerous short, pale yellow hairs on its upper and inner sides; first segment of the filament longest; the entire filament slightly sericeous in certain lights; mandibles black with a faint ferruginous tinge; with longitudinal striæ on the basal part of the under surface, a few long, yellow hairs on the inner edge, and a fringe of similar hairs on the posterior face.

Thorax.—Collar covered everywhere above with pale yellow, almost silvery pubescence, least dense near the middle line; with numerous long, pale yellow hairs; posterior surface not closely appressed against the mesonotum, it and the anterior face nearly vertical; the dorsal edge rather flattened above; the sides bare; prothoracic lobe with pale yellow pubescence behind; mesonotum with a yellow pubescent band at the side, extending backward from in front of the tegula till it barely meets the corresponding band of the other side on the median line behind; the rest of the plate closely punctured and covered with short, pale yellow hairs; anterior median groove faint; scutellum with a median depression, strongest behind, minutely punctured; postscutellum pale yellow, almost silvery pubescent to the groove at the side of the dorsum of the median segment but showing a median depression; dorsum of the median segment sparsely pale yellow, almost silvery pubescent and with quite a dense covering of rather short, pale yellow hairs; posterior end of the segment with two yellowish-silvery pubescent spots, confluent on the middle line, their dorsal portions extending a short distance along the suture from the fovea to the stigma; the area between this pubescence and the stigmatal groove black, roughened, particularly below; the end and sides of the median segment thickly clothed with long, pale yellow hairs; mesopleuron with a large, pale yellow pubescent spot just behind the prothoracic lobe; a rather broad, silvery strip of pubescence runs from above the hind coxa along the stigmatal groove to the stigma, then toward the base of the hind wing, becoming broader and with long, yellowish hairs, making this portion more yellow; petiole short, straight, black, yellowish-white sericeous and bearing quite long, pale yellow hairs.

Abdomen.—Not as long as the thorax, elongate-oval, quite pointed at both ends; above, ferruginous except for a narrow cross band of dark color just behind the petiole (not always present) and a cross

band of black on the third, fourth, and fifth plates, not usually covering all the surface of these plates; the ferruginous portions of the dorsal plates are somewhat varied in their depth of color; all the plates are sericeous; beneath, with a similar black band on the third, fourth, and fifth plates; there are a few punctures on the last three dorsal plates, being few in number and weak on the first two, and chiefly at the sides, but quite large and generally distributed on the terminal plate which bears a few brownish hairs; the surface beneath is glistening, with minute punctures and scattered hairs, the former becoming more abundant posteriorly.

Wings.—Yellowish hyaline, somewhat fuliginous on the outer margins, in some cases quite generally fuliginous; first and second transverse cubital veins close together on the radial cell in the fore wing, and the first recurrent vein almost interstitial with the second transverse cubital vein; tegulæ dark, nearly black, somewhat sericeous or almost pubescent near the middle.

Legs.—Coxæ black, the posterior pair silvery pubescent behind; all with numerous pale and dark yellowish hairs and rather sericeous; trochanters black, sericeous; the other segments ferruginous except the bases of the femora, the last one or two tarsal segments and the claws, the tarsal segments being brown, and the claws black tipped; fore metatarsus with nine comb teeth, shorter than half the length of the metatarsus; inner contour of the hind tibia straight, its posterior surface densely pale sericeous.

Variations.—Some one or more of the following variations often occur: The black on the first dorsal abdominal plate is sometimes absent; the terminal dorsal plate may be dark but not black; the black on the third, fourth, and fifth segments is not always continuous; and there is sometimes a tiny pubescent spot above the middle coxæ.

Length.—Females, 17—22 mm.

I have seen specimens of this species from Florida, Mississippi, Texas (Columbus), and Mexico. Fox reports it from Brazil. I am unable to distinguish *dubitatum* from what has been known as *Sphex dorsalis* Smith, regarded by Kohl as a variety of *Chlorion ichneumoneum*, and a long series of comparative measurements fails to show any differences. The only distinctions which are perceptible seem to be in the color of the pubescence, that of *dubitatum* being paler. In many cases, however, every gradation of shade between the two can be found, and certain other characters which are common to the two do not seem to occur in other species.

Kohl regards *micans* or *dorsalis* Smith as a variety of *ichneumoneum*. With this I am not prepared to agree, as *micans* is a more slender insect in proportion to its length, has black mandibles with at most only a faint ferruginous tinge, the scape is black, the anal segment is ferruginous, the teeth of the fore metatarsal comb are less than half

the metatarsus in length, meso- and metapleural pubescent spots are usually entirely absent and when present are very slight, and the pubescence generally averages paler than in *ichneumoneum*, though in southern specimens there may be little difference in this regard. As *micans* is preoccupied, however, *dubitatum* Cresson is the name which must be applied to this species.

Accepting *dubitatum* as a good species we find that all the specimens are females. A closely related species is *spiniger*, of which only males are known, found in the same territory, and in quite a collection of these insects from the West Indies which I have studied, every female was *dubitatum* and every male was *spiniger*. Taking these facts into consideration, I am of the opinion that these species will ultimately prove to be identical, and not a subspecies of *ichneumoneum*, but a valid species.

CHLORION (PROTEROSPHEX) MAXIMILIANI (Kohl).

Sphex maximiliani Kohl, Ann. natur. Hofmus. Wien, V, 1890, p. 429.

Medium sized, rather robust insects; head and thorax black; abdomen and legs black and ferruginous, the amount and distribution varying; pubescence golden to pale; quite hairy, the hairs being golden or paler; wings quite hyaline, somewhat tinged with yellowish near the base, rather fuliginous on the outer margins.

Female.—Not seen by me. Notes on differences from the male, taken from Kohl's description, are given below.

Male.—Head rather large; clypeus and frons to above the antennæ covered with golden pubescence and numerous long golden hairs; anterior margin of the clypeus black, somewhat emarginate; frons scatteringly, rather coarsely punctured above, with long yellow hairs; vertex and cheeks rather more closely punctured, covered with long yellow hairs, particularly long and dense on the lower part of the cheeks where there is also some golden pubescence; cheeks about half the width of the eyes; inner margins of the eyes slightly converging downward; antennæ black except the scape which is tinged with dark ferruginous below and bears numerous dull yellow hairs on its lower and inner sides; first segment of the filament longest, slightly larger toward its tip; mandibles two-toothed, black except for a pale yellowish ferruginous band at the base of the teeth, slightly punctured below, and with a partial fringe of short yellow hairs on the lower margin.

Thorax.—Covered everywhere except on the scutellum with quite long yellowish hair; collar with its anterior and posterior faces nearly vertical, the latter not closely appressed against the mesonotum; dorsal edge of the collar evenly rounded, highest in the middle, covered with yellow (sometimes pale) pubescence; the hairs so thickly cover the surface as to conceal all markings; prothoracic lobe with a narrow,

yellow pubescent band on the posterior margin; mesonotum with a narrow, much obscured, golden pubescent band on the side, beginning in front of the tegula and running backward on the margin of the plate, then inward on its posterior margin till it nearly or quite meets the band of the opposite side; the remainder of the surface of the plate quite closely, rather coarsely punctured and with a slight anterior median groove, extending hardly one-third of the length of the plate; scutellum with fewer, shorter hairs than the other parts of the thorax; its surface with rather more scattered punctures than the mesonotum, with a slight median groove, more pronounced behind; postscutellum obscurely golden pubescent, with a dense covering of long yellow hairs rather paler than those on the median segment; median segment everywhere covered with long yellow hairs, particularly long behind, where there are no pubescent spots; the dorsum finely, transversely aciculate; sides between the stigmatal groove and the petiole roughened; meso- and metapleura covered nearly everywhere with quite a thick covering of long yellow hairs; no pubescent band along the stigmatal groove; petiole short, straight, black, quite thickly covered with long pale-yellow hairs.

Abdomen.—Above, somewhat sericeous anteriorly; more or less of the first two dorsal plates ferruginous mingled with black, the other plates black; the last three plates with short, yellow, backwardly projecting hairs, few and at the sides on the anterior one, more abundant and extending toward the middle on the next, and generally distributed over the surface of the last; these plates also have correspondingly distributed punctures; beneath, the first two plates ferruginous mingled with black, the other plates black; all the plates have scattered punctures, chiefly at the sides, and a few rather long yellow hairs; the fifth, sixth, and seventh ventral plates are emarginate behind, the emargination being greater on the hinder plates and on the seventh almost becoming a notch; these three plates also bear numerous yellow hairs at the sides, almost forming tufts, much as in *C. ichneumoneum;* terminal plate like that of the last-named species.

Wings.—Quite hyaline, somewhat yellowish near the base and rather fuliginous on the outer margins; the venation as in *C. ichneumoneum:* tegulæ almost black, but with a brownish tinge, a little lighter on the outer border; faintly sericeous.

Legs.—Coxæ and trochanters black, more or less hairy; fore femora with numerous yellow hairs, ferruginous near the base and tip, elsewhere black; fore tibiæ ferruginous, sericeous; fore tarsi ferruginous, sericeous above, the last segment and the claws darker, the claw tips black; middle femora ferruginous at base and tip, with a few yellow hairs, chiefly below; middle tibiæ and tarsi ferruginous, somewhat sericeous above, the last tarsal segment and the claws darker, tips of the claws black; hind femora black except near the tip, with-

out hairs; hind tibiæ ferruginous except for a black stripe above; sericeous, especially behind; tarsi dull ferruginous, lighter at the tip of the metatarsus and of the next segment (sometimes the whole of these two segments); last three tarsal segments at least, darker; the tips of the claws black; spines on all the legs ferruginous; inner contour of the hind tibia straight.

Female.—Differing from the foregoing, according to Kohl's description, as follows: hind tibia without the black stripe above; there seems to be pubescence on the hinder end of the median segment in both sexes according to Kohl, but I have not found it in the males described above; inner margins of the eyes parallel; fore metatarsus with nine comb teeth; abdominal structures of the last few segments differing, of course.

Length.—Females, "22–24 mm." (Kohl); males, 15–24 mm.

I have seen three specimens of this species captured in Mexico (no closer data). Kohl thinks that it may be a variation of *Chlorion ichneumoneum*, and this may be correct, though I am inclined to doubt it.

CHLORION (PROTEROSPHEX) ICHNEUMONEUM (Linnæus).

Apis ichneumonea Linnæus, Syst. Nat., 10th ed., I, 1758, p. 578.
Vespa jamaicensis Drury, Ill. Exot. Ins., I, 1770, p. 104, pl. xliv, fig. 4.
Sphex ichneumonea Fabricius, Syst. Ent., 1775, p. 348.
?Sphex ornata Lepeletier, Hist. Nat. Ins. Hym., III, 1845, p. 314.
Sphex ichneumonea Walsh and Riley, Am. Ent., I, 1869, p. 127.
Sphex ichneumonea Packard, Guide to Study of Ins., 2d ed., 1870, p. 167.
Sphex ichneumonea Cresson, Trans. Am. Ent. Soc., IV, 1872, p. 213.
Sphex ichneumonea Riley, 1st Rept. U. S. Ent. Com., 1878, p. 318.
Sphex ichneumonea Patton, Proc. Bos. Soc. Nat. Hist., XX, 1880, p. 382.
Sphex ichneumonea Cameron, Biol. Centr.-Amer., Hym., II, 1888, p. 34, pl. iii, figs. 8, 8*a*.
Sphex ichneumonea Provancher, Addit. Faun. Can. Hym., II, 1889, p. 257.
Sphex ichneumoneus Kohl, Ann. natur. Hofmus. Wien, V, 1890, p. 430.
Sphex ichneumonea Ashmead, Psyche, VII, 1894, p. 64.
Sphex ichneumoneus Fox, Proc. Acad. Nat. Sci. Phila., 1897, p. 377.
Sphex ichneumonea Peckhams, Wisc. Geol. and Nat. Hist. Surv., Bull. 2, 1898, p. 33, pl. ii, fig. 4; pl. xi, fig. 1; pl. xii, figs. 1, 2.
Sphex ichneumoneus Ducke, Zeits. f. Syst. Hym. u. Dipt., I, 1901, p. 242.
Sphex ichneumonea Peckhams, Wasps, Social and Solitary, 1905, p. 56.

Rather robust insects, of medium size; head, thorax, petiole, and bases of the legs black; abdomen black and ferruginous; legs mainly ferruginous; wings nearly hyaline to quite fuliginous; pubescence golden or a little paler; hairs golden to pale straw.

Female.—Head rather large, quadrangular when viewed from above, the cheeks being quite wide; clypeus somewhat arched laterally, all but its anterior margin thickly covered with golden pubescence and numerous long golden hairs; the pubescence may be thin or absent along the median line anteriorly; anterior margin somewhat reflexed, rounded, with a pair of short, blunt, projecting lobes at the middle, separated

by a slight notch and sometimes with a slight notch lateral to each; the reflexed margin with a tendency to ferruginous; pubescence continued upward from the clypeus over the frons to above the antennæ, sometimes nearly to the ocelli, mixed with golden hairs averaging a little shorter than on the clypeus; frons and vertex with scattered, minute punctures; occiput minutely punctured, bearing dark and yellow hairs about as long as those on the frons; a transverse-oval area just behind the ocelli is rather velvety black; cheeks nearly as wide as the eyes, with a golden pubescent band close behind the eyes, not reaching their tops, and variable in width and amount; with very long yellow hairs, most abundant low down; inner margins of the eyes parallel; scape of the antennæ ferruginous, either entirely or with more or less black above, with short yellowish hairs, particularly on the inner side; pedicel short, black, sometimes slightly ferruginous beneath; filament black, its first segment much the longest; mandibles large, stout, two-toothed, the teeth black to their bases, the remainder of the mandible ferruginous, with a few long light-colored hairs on the inner margin, pointing toward the anterior tooth; outer margin with scattered light-colored hairs; anterior face with a few elongated indentations on the ferruginous portion.

Thorax.—Anterior face of the collar rising nearly at right angles to the neck, rather flattened from side to side, golden pubescent, least so in the middle; dorsal edge evenly rounded from side to side, golden pubescent, the edge and the anterior face bearing long, golden hairs; posterior face not closely appressed against the mesonotum; side in front of the prothoracic lobe black, glistening, though with many hairs; the prothoracic lobe black in front, golden pubescent behind, and bearing long, golden hairs; mesonotum black, with a band of golden pubescence on each side extending from the prothoracic lobe upward, then backward, then inward on the posterior margin of the plate, where it is narrower, till it meets the band from the opposite side; lateral margins of the plate slightly reflexed; remainder of the plate black, coarsely, closely punctured, and with many short, yellow hairs; with a slight anterior median groove extending about one-third of the length of the plate; the surface of the plate is sometimes so thickly covered with hairs as to partly conceal the pubescent bands and give the whole area a dull brownish yellow appearance; scutellum black, somewhat arched, with a median longitudinal groove, more marked behind, finely, sparsely punctured and almost devoid of hairs, except when the insect is unusually hairy; postscutellum with a median longitudinal groove; golden pubescent as far laterally as the lateral suture of the dorsum of the median segment; median segment black, covered above and behind with golden pubescence, not generally so dense above as to conceal the surface, which is minutely, transversely aciculate; from the fovea to the petiole the pubescence is very thick,

its margin following the outer edge of the dorsum about half way from the fovea to the stigma, then obliquely backward to the lower part of the side of the petiole, thus leaving a black strip between it and the stigmatal groove; the entire dorsum, sides and end of the median segment bearing thickly set, long, yellow hairs, longer behind; these hairs are sometimes quite pale, giving a dull yellow color to this portion of the body; prosternum golden sericeous in front of the anterior coxæ, and with long, yellow hairs; mesopleuron with an irregularly vertical band of golden pubescence just behind the prothoracic lobe, which bends forward above toward the front end of the mesonotal band; metapleural lobe golden pubescent, as is also a spot just above and in front of the mesocoxa; above the hind coxa, below the stigmatal groove, is a similar, more elongated spot, more or less continuous, with a pubescent band extending downward along the groove (often on both sides of it) from the stigma and forward to the anterior end of the median segment; petiole short, straight, black, about two-thirds as long as the second hind tarsal segment or the first segment of the filament; with numerous short, yellow hairs and a tendency toward pubescence.

Abdomen.—First two segments black, the third more or less so; the remainder black; above, sericeous, more noticeable anteriorly, smooth, more or less varied with darker; last four segments punctured, the first very faintly and sparsely, the punctures becoming more pronounced and closer on the more posterior plates; there is a median, triangular area on each of these plates except the last, not encroached upon by the punctures; the last three plates bear a few brownish hairs, chiefly at the sides, and quite long on the last two; beneath, colored as above; surface glistening, not sericeous, the plates with scattered, rather coarse punctures and scattered ferruginous hairs, almost entirely lacking along the median line except on the terminal plate; the hairs show a tendency to form a row on each plate parallel to and a little in front of the posterior margin, except on the last plate.

Wings.—Yellowish hyaline, particularly toward the base, becoming fuliginous on the outer borders; in some cases the fuliginous is strong and quite generally distributed, and then there is a violet reflection; second and third transverse cubital veins of the fore wing not near each other on the radial vein but nearer than on the cubital; transverse median vein of the hind wing somewhat arched, making at least a right angle with the median vein; discoidal vein almost interstitial; cubital vein bending backward somewhat near its middle, well developed beyond the transverse cubital; tegulæ pale ferruginous, sparsely punctured, with traces of golden pubescence in the center in some cases. (Plate VII, fig. 7.)

Legs.—Coxæ and basal portion of the trochanters black, the proportion in the latter segment varying; coxæ sericeous, with numerous

hairs, also present on the trochanters; rest of the legs ferruginous except the tips of the claws (Plate IX, fig. 18), which are black; spines ferruginous; hind tibiæ yellow sericeous behind, their inner contour straight; fore metatarsi with nine (or sometimes ten) comb teeth, more than half as long as the metatarsus. (Plate VI, fig. 5).

Male.—Differs from the female as follows: Anterior margin of the clypeus less reflexed, broadly but slightly emarginate, without teeth; anterior tooth of the mandible less divided; legs more generally sericeous; fourth, fifth, sixth, and seventh ventral abdominal plates emarginate, this increasing posteriorly so that the seventh is quite deeply notched; the fifth, sixth, and seventh plates each with short ferruginous-brown hairs, particularly at the sides, where they almost form tufts; terminal plate with its posterior margin rounded at the sides, acuminate in the middle, very slightly carinate along the median line; last three plates above quite hairy; dorsal terminal plate sometimes with a median longitudinal groove on its anterior portion; its posterior margin evenly rounded; transverse median vein of the hind wing generally less arched and making no more than a right angle with the median vein.

Variations.—In some cases there are black areas on all the dorsal abdominal plates; the femora also show a few black markings, and less often the entire abdomen may be nearly all almost black. Northern specimens are liable to be particularly hairy, the hairs being pale yellow, giving the insects a fuzzy, pale, yellowish brown appearance, and partly concealing the pubescence, which also seems to be less developed in such specimens.

Length.—Females, 20–25 mm.; males, 16–23 mm.

This species has probably the widest distribution of any of the Chlorioninæ in America. I have seen specimens from Maine, New Hampshire, Massachusetts, New York, Ontario, Wisconsin, Michigan, Illinois, and Colorado on the north, and from almost every State southward to Florida, Texas, New Mexico, northern and southern California, Utah, Nevada, and Colorado. I have also seen it from Mexico, and it is reported by Fox and Ducke from Brazil. Kohl and Cameron state that it occurs in Guatemala, Nicaragua, Costa Rica, Panama, Guiana, Venezuela, Cuba, Jamaica, and Santo Domingo. These last lists, however, include the subspecies, and I have no means of determining in which of these localities the typical form of the species occurs.

In Massachusetts it is taken in late June, July, August, September, and rarely in early October. It visits the flowers of sumach, clematis, asclepias, mint, ceanothus, and other plants.

A specimen of this species from Para, Brazil, has a ferruginous petiole, but in all other regards seems to be typical.

This species is well pictured in the Insect Book (Plate V, fig. 18).

CHLORION (PROTEROSPHEX) ICHNEUMONEUM AURIFLUUM (Perty).

Sphex auriflua PERTY, Delect. anim., 1834, p. 142.
Sphex ichneumoneus var. *auriflua* KOHL, Ann. natur. Hofmus. Wien, V, 1890, p. 431.

This subspecies differs from *C. ichneumoneum* as follows: The petiole and abdomen are ferruginous, the latter having a clear, reddish or resin-like shade; the legs, except the coxæ, are also of this color; the wings are rather fuliginous, but no more so than is sometimes the case in the typical form; the pubescence and hairs are a darker, richer golden, and the body as a whole appears somewhat more slender in proportion to its length than in the typical form. The length is about the same.

I have studied specimens of this subspecies from Florida (Chokoloskee) and from Cuba. Kohl reports it from Mexico and Venezuela. In some examples portions of the abdomen are darker than the rest.

CHLORION (PROTEROSPHEX) ICHNEUMONEUM FULVIVENTRIS (Guerin).

Sphex fulviventris GUERIN, Duperry, Voy. Coquille, Zool., II, 1830, p. 1.
Sphex ichneumoneus var. *fulviventris* KOHL, Ann. natur. Hofmus. Wien, V, 1890, p. 431.

This subspecies differs from the typical form as follows: Petiole and abdomen entirely ferruginous red, as in the last subspecies, more or less varied with darker; coxæ black; anterior trochanters partly, middle and posterior ones wholly ferruginous (I believe this may be variable); rest of the legs ferruginous except the claws and pulvilli which are dark or black, and the last tarsal segment which is sometimes darker than the rest; wings quite strongly fuliginous; mesonotum with a pubescent band along the anterior median groove; body hairs sometimes decidedly reddish.

Length.—20–27 mm.

I have examined specimens of this subspecies from Chokoloskee and Miami, Florida; Spanish Wells, Bahama Islands; Habana, Cuba, and from Jamaica. I have also seen specimens which are intermediate between this and the preceding subspecies.

CHLORION (PROTEROSPHEX) CALIGINOSUM (Erichson).

Sphex caliginosa ERICHSON, Schomburgk, Reise in Guiana, III, 1848, p. 589.
Sphex erythroptera CAMERON, Biol. Centr.-Amer., Hym., II, 1888, p. 30, pl. III, figs. 1, 1a.
Sphex caliginosus KOHL, Ann. natur. Hofmus. Wien, V, 1890, p. 415.

Large, robust insects; body and legs entirely black; wings hyaline, with a dark yellowish-brown tinge near the base, the outer margins slightly fuliginous; hairs black.

Female.—Head large, rather quadrangular when viewed from above; clypeus quite convex laterally, coarsely, not closely punctured, and bearing long, rather stout, black hairs; its anterior margin reflexed, smooth, and with a broad shallow notch in the middle; sides of the frons and around the bases of the antennæ covered with long hairs; the antennæ appear to arise from slight depressions of the frons, which is very minutely punctured above except near the sides of the lateral ocelli; vertex and cheeks scatteringly punctured, with long hairs; the cheeks nearly as wide as the eyes; antennæ black, the first segment of the filament longest, one-third longer than the second; mandibles black, stout, with a trace of dark ferruginous near the base of the anterior tooth; front face with scattered aciculations along its lower edge and with a number of long hairs on this edge or on the hinder face.

Thorax.—Collar narrow, almost vertical in front and behind, not closely appressed against the mesonotum, rather flat near the median line; on the edge punctured, and with numerous hairs, shorter than those of the cheeks; prothoracic lobe sparsely, minutely punctured, with hairs of medium length and a fringe of pale brown hairs on its posterior margin; mesonotum minutely, closely punctured, covered with very short hairs; the anterior median groove not very pronounced; at the sides, beginning near the front edge of the tegulæ, the lateral margin is somewhat reflexed, this continuing backward, then inward on the hinder margin till the scutellum reaches its level; scutellum glistening, with minute, scattered punctures; with a broad, shallow, median depression behind; at each side near the anterior margin is a short, oblique ridge running outward and backward; postscutellum glistening, sparsely, minutely punctured, with an evident median groove; median segment dull black, closely punctured, and quite closely covered with rather short, blackish, brownish, and grayish hairs, with a suggestion at some angles of faint transverse aciculations; the dorsum with a slight median depression, broadest behind; fovea rather narrow, crescentic; posterior end and sides of the median segment rather finely, not closely punctured, covered with rather long black hairs mixed with a few grayish ones; sides of the thorax with scattered punctures and long hairs; petiole straight, shorter than the posterior coxæ, with scattered minute punctures and long black hairs.

Abdomen.—Long, ovate, rather more pointed behind than in front; above glistening, with scattered very minute punctures, becoming larger and more noticeable on the last three, and particularly on the last two plates, which bear brownish-black hairs on their sides, longer on the terminal plate; beneath glistening, with scattered punctures, particularly on the sides of the plates, from which hairs arise; on the last three plates the punctures and hairs are more closely placed; the first ventral plate has two ridges diverging backward from the end of the petiole.

Wings.—Yellow hyaline, somewhat fuliginous along the outer margins and quite dark yellowish-brown near the base; cubital vein of the hind wing frequently bent backward slightly near its middle, obsolete beyond the transverse cubital which seems to be a part of it rather than a cross vein; from the middle of the backward bend is a shadow as of an obsolete vein running outward and backward; transverse median vein nearly straight, about at right angles to the median vein; tegulæ brownish-black behind, black in front, with a few minute punctures on the anterior portion; more or less reflexed on the margins.

Legs.—Black; coxæ, trochanters and outer side of the femora with black hairs; fore metatarsi with ten or eleven comb teeth more or less alternating with spines; hind tibiæ with the inner contour straight except for a slight, elongated enlargement near the base; claws slightly lighter colored in the middle.

Male.—Differs from the female as follows (taken from Kohl, as I have not seen this sex): Clypeus more strongly arched, its anterior margin truncate, without a reflexed edge; fifth, sixth, seventh, and eighth ventral abdominal plates with a thick clothing of brownish hairs.

Length.—Females, 28–34 mm.; males, 28–31 mm.

Specimens of this large species have been captured in Mexico, North Yucatan, British Honduras, Guatemala, Costa Rica, Panama, Venezuela, and Brazil, according to Kohl. Those I have seen were taken in Mexico, Santo Domingo, and Brazil, and one specimen taken Feb. 2, 1906, at Grenada, West Indies, which has the wings darker and more brownish than usual.

CHLORION (PROTEROSPHEX) PENSYLVANICUM (Linnæus).

Sphex pensylvanica Linnæus, Centur. Ins. rar., 1763, p. 30 (not seen).
Sphex pensylvanica Linnæus, Amoen. acad., VI, 1763, p. 412 (not seen).
Sphex pensylvanica Linnæus, Syst. Nat., 12th ed., I, 1767, p. 941.
Sphex pensylvanica De Geer, Mem. Hist. Ins., III, 1773, p. 586, pl. xxx, fig. 2.
Sphex pensylvanica Fabricius, Syst. Ent., 1775, p. 346.
Pepsis pensylvanica Fabricius, Syst. Piez., 1804, p. 211.
Sphex pensylvanica Patton, Proc. Bos. Soc. Nat. Hist., XX, 1880, p. 383.
Sphex pensylvanicus Kohl, Ann. natur. Hofmus. Wien, V, 1890, p. 418.

Large, robust insects; body and legs black; hairs black; wings strongly fuliginous, with a bluish or violet reflection; pubescence generally absent, silvery when present.

Female.—Head broad, quite quadrangular from above, the cheeks being full; clypeus strongly arched, its anterior margin evenly rounded, slightly reflexed, with a pair of very short, broad lobes at the middle; its surface coarsely punctured, with many, long, stout hairs, and in some cases with traces of silvery pubescence at the sides below the eyes; frons rather less coarsely punctured, quite smooth between the base of the clypeus and the antennæ; with rather shorter

and more slender hairs, this being more noticeable near the ocelli; frontal suture well developed, continuing behind the ocelli; a suture runs obliquely backward just outside the ocelli; lateral ocelli nearer each other than to the eyes; vertex and cheeks rather finely punctured; with many quite long hairs, both being coarser on the lower part of the cheeks, which at their widest part are nearly as wide as the eyes; inner margins of the eyes parallel; antennæ black, the scape with short hairs; first segment of the filament longest; the filament rather brownish sericeous; mandibles stout, black, tinged near the bases of the teeth with ferruginous; each reaching to the base of the other when closed; the anterior face strongly marked with ridges and aciculations, the inner edge near its base with a row of long, black hairs, and a similar row, but longer, on the posterior face close to the outer edge.

Thorax.—Anterior face of the collar sloping upward at first from the neck below, then vertical; dorsal edge narrow from front to rear, rather flattened in the middle; posterior face closely appressed against the mesonotum; surface of the collar with numerous fine punctures and short hairs; prothoracic lobe with numerous hairs and a fringe of short, pale brown ones on the posterior margin; mesonotum closely, rather finely punctured, bearing many short hairs; its anterior median groove pronounced, extending backward one-third to one-half the length of the plate; lateral margin somewhat reflexed from the prothoracic lobe back to the posterior angle, then inward to where the scutellum rises to its level; scutellum large, quite high in the middle, with an evident median groove; its outer part in front reflexed; its surface minutely punctured and bearing short, erect hairs, chiefly at the sides; postscutellum narrow, with a median groove, with hairs and punctures about like the scutellum; dorsum of the median segment coarsely roughened, almost transversely rugose, with a median depressed line which broadens behind to form a depressed area; the surface with many short, erect hairs; fovea large, shallow, crescentic; posterior end and sides of the median segment like the dorsum but bearing longer, more closely placed hairs; meso- and metapleura smoother, with scattered punctures, fewest on the horizontal part and lower half of the vertical part of the metapleura; with scattered, long hairs; petiole short, straight, with numerous long hairs.

Abdomen.—Elongate ovate, about as much pointed in front as behind; quite gray sericeous above; the last two plates punctured and bearing hairs, both being coarsest on the last plate, the posterior margin of which is rather acuminate at its sides but bluntly rounded in the middle; beneath gray sericeous, with fine, scattered punctures and short hairs, both being more abundant and much coarser on the last two plates; posterior margin of the fifth plate emarginate; last plate narrow, rather conical, its posterior margin narrowly rounded.

Wings.—Strongly fuliginous, with a strong bluish to violet reflection inside the outer ends of the cells, beyond which it is absent; transverse median vein of the hind wing nearly straight, making a little more than a right angle with the median vein; discoidal vein nearly interstitial; the median, cubital, and subdiscoidal veins of both wings well developed beyond the ends of the cells; tegulæ black, sericeous.

Legs.—All the coxæ, trochanters, and femora grayish sericeous, with scattered punctures and hairs least developed on the hinder pair; tibial and tarsal spines black; inner contour of hind tibiæ straight, the hinder face coarsely sericeous; fore metatarsus with nine comb teeth, shorter than half the metatarsus; the fringe on the hind tibial spine is coarse, almost tooth-like; tarsi rather sericeous.

Male.—Differs from the female as follows: with more or less of silvery pubescence on the front of the head; generally with a small, silvery pubescent spot on the mesopleuron behind the prothoracic lobe; sometimes one at the base of the hind coxa, and rarely, one in the form of a crescent above the petiole and one on the posterior side of the hind coxa; seventh ventral abdominal plate quite deeply excavated behind and with a tuft of black hairs at each side; terminal ventral plate frequently densely clothed with pale brownish hairs.

Length.—Females, 25–34 mm.; males, 19–28 mm.

This insect is quite common in the United States throughout the Upper and Lower Austral life zones. The most northern localities from which I have seen specimens are Durham, New Hampshire; Malden and Amherst, Massachusetts; New York, Indiana, Michigan, and Minnesota. From these States it is generally distributed to Georgia and Texas, while in the West I have seen examples from Folsom and Eldorado counties, California; and from Fort Lupton, Colorado. It should also occur in the mountainous regions of Mexico.

Howard (The Insect Book, Plate VII, fig. 20) gives a good picture of this insect.

CHLORION (PROTEROSPHEX) CHICHIMECUM (Saussure).

Sphex chichimecus Saussure, Reise d. Novara, Hym., 1867, p. 40.

Sphex chichimeca Cameron, Biol. Centr.-Amer., Hym., II, 1889, p. 33, pl. III, figs. 6, 6*a*

Sphex chichimecus Kohl, Ann. natur. Hofmus. Wien, V, 1890, p. 420.

Female.—Unknown.

Male.—Black, with silvery white pubescent spots; wings transparent except on the outer margins and along the veins, where they are fuliginous, with faint bluish-violet reflection; rather slender insects.

Head.—Quite broad and somewhat quadrangular from above, though the cheeks retreat sharply from the hinder margin of the eyes; clypeus somewhat arched laterally, with a slight longitudinal ridge on its upper third; black, rather sparsely silvery pubescent, least in the middle, and

with numerous, quite long, erect, black hairs; anterior margin somewhat rounded downward at the sides, the middle slightly, broadly emarginate and with no reflexed rim; the clypeal pubescence extends upward on the frons to above the level of the antennæ, and at the sides nearly as far as the level of the anterior ocellus; entire surface of the frons and vertex quite thickly covered with long, black hairs; frontal suture noticeable, forking in front of the ocelli; lateral ocelli nearer each other than to the eyes; just behind the ocelli is a slightly elevated, transverse-oval area which is somewhat blackish sericeous; frons and vertex finely punctured; cheeks very flat, retreating sharply from the posterior margin of the eyes, very slightly silvery-white pubescent close to the edge of the eye, and quite thickly clothed with long, white hairs, longer and closer below; inner margins of the eyes converging downward somewhat; antennæ black, the scape with a tinge of ferruginous below; rather glistening; relative lengths of the filament segments $\frac{1}{2}\frac{}{5}$, $\frac{2}{1}\frac{}{7}$, $\frac{3}{1}\frac{}{6}$, $\frac{4}{1}\frac{}{7}$; mandible black, of moderate size, two-toothed, with a few short hairs on its posterior face and slight aciculations on its anterior face; the mandible seems to be rather short to reach the base of the other when closed.

Thorax.—Collar black, its anterior face almost vertical; dorsal edge with a narrow band of silvery-white pubescence; the edge is not evenly rounded, but somewhat raised at the middle; anterior face black sericeous, with numerous, fairly long, grayish hairs; posterior face vertical, not closely appressed against the mesonotum, though quite close to it; anterior face of the collar and dorsal surface of the neck meeting at a right angle; the sides of the former quite thickly covered with fairly long, grayish hairs; prothoracic lobe silvery-white pubescent behind, and with a few long, whitish hairs; mesonotum with a narrow, silvery-white pubescent band on each side, beginning opposite the front margin of the tegula and extending back to the posterior end of the plate, then inward to meet the band from the other side; elsewhere black, somewhat sericeous, and with numerous rather short, gray or dark hairs; scutellum rather high, arched, black sericeous, with a slight median longitudinal groove, rather finely punctured, and with short gray hairs; postscutellum silvery-white pubescent as far laterally as the groove leading to the stigma of the median segment, and with quite numerous gray hairs; median segment black, its dorsum dull, dead black, with numerous fine punctures and long, whitish hairs; posterior end not forming a sharp angle with the dorsum; fovea shallow, crescentic; posterior end sparsely silvery-white pubescent, chiefly behind, and not extending to the stigmatal groove; with numerous long, whitish hairs; there is a band of silvery-white pubescence extending from the hind coxa along the stigmatal groove about halfway to the stigma; behind and below the prothoracic lobe is a silvery-white pubescent spot on the mesopleuron, and also one above

the mesocoxa extending upward toward the other; remainder of the surface of the meso- and metapleura black, finely punctured, and quite thickly covered with rather long, whitish hairs, longest below and just under the base of the hind wing; petiole short, straight, black, with numerous long, whitish hairs, and apparently with a tinge of dull ferruginous above, close to its junction with the abdomen; the length of the petiole about four-fifths that of the second hind tarsal segment.

Abdomen.—Black with a bluish reflection; rather slender and about equally pointed at both ends; the first dorsal plate coarsely grayish sericeous and with numerous moderately long, whitish hairs; the other dorsal plates very slightly sericeous but glistening, and with numerous fine punctures; the sixth, seventh, and eighth plates more coarsely punctured, and with coarser black hairs, closer together at the sides; terminal plate evenly rounded behind; the posterior margins of the two preceding plates slightly emarginate; beneath, black, glistening, with a slight bluish reflection; with scattered, fine punctures and black hairs; on the first plate, just at the junction of the petiole and abdomen, is a short, median ridge; the sixth plate is narrowest, broadly, slightly emarginate behind; seventh plate emarginate behind, with a number of erect, short, black hairs on the lateral margin, not quite dense enough to form a tuft; eighth plate quite thickly covered with very short, grayish hairs, its hinder margin a little nearer to being pointed than rounded; in some lights a lesser amount of hairs along the median line gives the appearance of a faint, median ridge, not really present.

Wings.—Semihyaline except on the outer margin and along the veins where they are fuliginous with a faint, violet reflection; radial cell of the forewing somewhat fuliginous; transverse median vein of the hind wing slightly arched, forming very little less than a right angle with the median; discoidal vein not quite interstitial; cubital and radial veins well developed beyond the transverse cubital vein; tegulæ black, slightly sericeous near the middle, and with fine, scattered punctures.

Legs.—Black; fore coxæ sparsely silvery-white pubescent anteriorly, and with many long, gray hairs; the other coxæ, the trochanters and the femora grayish sericeous and with many quite long, grayish hairs; tibiæ slightly grayish sericeous, the hind pair longer than the femora, the others shorter; hind tibiæ strongly brown sericeous behind; their inner contour straight; tarsi grayish to brownish sericeous.

Length.—Males, 19 mm. (one specimen); Kohl gives 24 mm.

I have seen but one specimen of this species, taken in Santo Domingo. Other captures were from Mexico (Orizaba). It seems to be rare. The specimen I have seen is in the collection of the American Entomological Society and bore a label in Cresson's handwriting, which indicated that he thought it might be the male of his *mandibularis*, an idea which may prove to be correct.

CHLORION (PROTEROSPHEX) MANDIBULARIS (Cresson).

Sphex mandibularis Cresson, Trans. Am. Ent. Soc., II, 1869, p. 293.
Sphex mandibularis Kohl, Ann. natur. Hofmus. Wien, V, 1890, p. 447.

Type.—One female specimen collected by Dr. J. Gundlach in Cuba; now in the collection of the American Entomological Society in Philadelphia.

The following description has been prepared from the type:

Female.—Black; wings hyaline, the outer half somewhat fuliginous; pubescence rather dull, of a pale creamy brown color, perhaps not entirely natural; about the size of large specimens of *C. ichneumoneum*, with a stout abdomen.

Head.—Rather quadrangular from above; clypeus quite strongly arched, black, its extreme lateral angle below the eye ferruginous; covered with brownish pubescence, thickest at the sides, and with long, black hairs; its anterior margin convex, evenly rounded, with a slight median notch; the pubescence extends up the sides of the frons to the level of the lateral ocelli; vertex with mixed blackish and whitish hairs which are quite long; cheeks stout, nearly as wide as the eyes, their greatest width lower down than usual; with a narrow pubescent band close behind the eye above; with a few black, and more gray hairs, most abundant and longest below; antennæ black, the scape with a few short hairs; the first segment of the filament longest; mandibles quite long, of the average stoutness, ferruginous to the bases of the teeth, the remainder black; the ferruginous part closely, coarsely grooved; with mingled ferruginous and whitish hairs behind.

Thorax.—Horizontal part of the neck with an oblique pubescent band running outward and backward on each side; anterior face of the collar nearly vertical; dorsal edge narrow, pubescent; posterior face closely appressed against the mesonotum; the surface black sericeous, with long, gray hairs; the dorsal edge evenly rounded from side to side, lower than the mesonotum; prothoracic lobe black, pubescent behind, and bearing long, gray hairs; mesonotum coarsely black sericeous; with a lateral, pubescent band beginning at the front of the tegula and running backward, then inward and almost or quite meeting the band of the other side; the anterior median groove pubescent; the surface of the mesonotum with numerous, rather short, gray, and a few black hairs; scutellum with a slight median groove; coarsely black sericeous and with numerous rather short hairs; postscutellum pubescent, without any evident groove; median segment quite thickly covered with long cream-colored hairs; behind and at the sides the same, except that the hairs are white and longer (the dorsum has been wet and the hairs are so matted that exact conditions there are uncertain); stigmatal groove present; there is a small pubescent spot behind the prothoracic lobe, a short, small band running upward from the middle

coxa, and a broader band running upward from the base of the hind coxa about half way to the stigma; the rest of the pleural surfaces black sericeous, with quite long, whitish hairs; petiole shorter than the hind coxa, straight, black, well clothed with short, and some longer, white hairs.

Abdomen.—Rather short, stout, ovate, more pointed behind than in front, black above; anterior plates sericeous, with a few scattered, rather coarse punctures on all the plates; the last three plates with short to long, black hairs; last plate rounded acuminate behind; beneath black, somewhat glistening, with scattered, rather coarse punctures and black hairs, most coarse and abundant posteriorly; the terminal plate rounded acuminate behind.

Wings.—Hyaline, slightly fuliginous along the veins and outer half; first transverse cubital vein of the fore wing curving into the second cubital cell; transverse median vein of the hind wing leaving the median at a right angle with the latter, but curving somewhat, almost at once, so that as a whole the angle between the two veins is less than a right angle; discoidal vein nearly but not quite interstitial; cubital vein well developed beyond the transverse cubital vein; tegulæ black.

Legs.—Black; anterior coxæ sericeous, almost pubescent outside, and with numerous long, gray hairs; posterior coxæ slightly pubescent behind; the legs as a whole strongly sericeous; hind legs with a faint reddish-brown tinge; fore metatarsus with ten comb teeth about half as long as the metatarsus; diameter of the hind tibia gradually increasing outward, but with a slight additional increase near the tip; hind tibial comb coarsely fringed, almost with spines rather than hairs; posterior face of the hind tibia strongly brown sericeous; claws two-toothed, black.

Length.—Female, 23 mm.

This interesting insect seems to be different from any of the other species of *Chlorion* which I have seen. If not, it is certainly an aberrant. Its general appearance is such that I regard Cresson's suggestion that it may be the female of *C. chichimecum* as not unlikely to be correct. Thus far Cuba is the only locality known for it.

CHLORION (PROTEROSPHEX) BEATUM (Cameron).

Sphex beata Cameron, Biol. Centr.-Amer., Hym., II, 1888, p. 31.
Sphex beatus Kohl, Ann. Natur. Hofmus. Wien, V, 1890, p. 424.

I have seen no specimens of this species in any of the collections which have come to me, accordingly I give here a translation of Kohl's description, making certain changes (he counts the pedicel as the first segment of the filament) of names, in order that it may agree with the other descriptions in this paper. This will also include Cameron's original description as Kohl included that in his. I have omitted Kohl's Latin diagnosis.

Length.—20 mm., male.

Form slender, also the legs and antennæ.

Black. Fore and middle legs in part rust red; hairs of the head and thorax yellow; almost no pubescent spots are noticeable; wings strongly fuliginous with blue-violet reflection.

Clypeus squarely cut off in front; inner borders of the eyes slightly converging toward the clypeus; nearest distance of the eyes at the vertex equal to the length of the first and half of the second filament segments; scutellum arched as usual.

Dorsum of the median segment finely transversely aciculate; petiole relatively long, as long as the second segment of the very elongated hind foot, also as long as the pedicel and first filament segment together; ventral plates of the fifth, sixth, and seventh segments without close, long hairs or pubescence; form of the ventral plate of the eighth segment; Plate XII, fig. 101.

Cameron has sent me the male but not the female to examine. Therefore I give here the description of that author:

Nigra, femoribus tibiisque anticis rufis, capite, pro et mesonoto dense aureo-villosis, metonoto dense albo-villoso; alis violaceis ♂ ♀.

Long, 30 mm.

Habitat.—Mexico, Temax, in north Yucatan (Gaumer); Guatemala, Pantaleon, 1,700 feet (Champion).

On the head the golden pile is very dense, except on the center of the clypeus, and on the vertex and occiput (perhaps rubbed off); the pronotum in front is bare, and the center of the mesonotum also. Eyes parallel, but very slightly converging at the top. Clypeus with some large punctures, the apex rounded, the furrow wide and deep; basal half of the mandibles reddish, aciculated. Mesonotum slightly depressed toward the apex in the center, as is also the pronotum; metanotum opaque, coarsely transversely aciculate, densely covered with a soft, white, woolly pubescence, and slightly depressed in the center toward the apex. Petiole as long as the hind coxæ, sparsely covered with long, white hair. Apex of the abdomen slightly punctured and sparsely covered with long hair.

The statement as to the length of the species, 30 mm., appears to be an error, as the male type sent measures only 20 mm.

In some regards this description is suggestive of *Chlorion mandibularis* Cresson.

CHLORION (PROTEROSPHEX) BRASILIANUM (Saussure).

Sphex brasilianus Saussure, Reise d. Novara, Hym., 1867, p. 39.
Sphex tinctipennis Cameron, Biol. Centr.-Amer., Hym., II, 1888, p. 32, pl. III, fig. 5.
Sphex brasilianus Kohl, Ann. natur. Hofmus. Wien, V, 1890, p. 426.
Sphex brasilianus Kohl, Ann. natur. Hofmus. Wien, X, 1895, p. 60.
Sphex brasilianus Fox, Proc. Acad. Nat. Sci. Phila., 1897, p. 376.
Sphex brasilianus Ducke, Zeits. f. Syst. Hym. u. Dipt., I, 1901, p. 242.

I have seen no specimens of this species, and am therefore obliged to give here a translation of the description given by Kohl:

Length.—20–25 mm., female.

Body black. Legs wholly black or more or less red. In the example described by Saussure the entire femora, tibiæ, and tarsi are rust red; in other examples in the Vienna Natural History Museum dark pitchy red spots show on the four anterior legs; Cameron's type has the legs entirely black. Wings pale, with a weak yellow reflection.

Head and thorax with rich pubescent spots; these are yellowish-white, nickel colored. This pubescence is present on the collar, as lateral bands on the dorsulum, upon the prothoracic lobes, as spots immediately behind this and on the mesopleuron above the middle coxa, as a streak following the stigmatal groove on the metapleuron, on the postcutellum, and upon the hinder end of the median segment. In Saussure's specimen of *brasilianus* the entire end of the median segment is not pubescent, but ornamented by two stripes which are separated by a bare spot. Longer hairs dirty white.

Inner margins of the eyes parallel. Least distance apart of the eyes upon the clypeus less than double the length of the petiole, which is scarcely shorter than the second and longer than the third hind tarsal segment. Least distance apart of the eyes upon the vertex slightly greater than the length of the first segment of the filament. Dorsum of the median segment finely leather-like; somewhat shorter than in *texanus*, and therefore appears more compact.

Metatarsus of the fore legs with eight comb teeth on the outer border. Inner contour of the hind tibiæ straight. (Kohl, 1890.)

Male.—Black. Legs for the greater part pitchy red; in the specimen before me the coxæ, the trochanters and the femora on their posterior side except on the tip are pitchy red. The long abundant hairs of the head, thorax, and median segment are dirty yellow; the collar above, the prothoracic lobes, and a spot behind them, a spot above the middle coxæ and another above the hind coxæ, the dorsulum on the inner border of the bases of the wings (lateral bands), the postscutellum and the median segment on both sides behind near the petiole are coppery yellow pubescent. Wings quite clear, with a weak yellow reflection.

Mandible two-toothed. The labrum shows only a hint of a median longitudinal ridge. The inner margins of the eyes converge toward the clypeus. The least distance apart of the eyes at the clypeus about equals the length of the first plus half that of the second filament segment; and upon the vertex equals that of the pedicel plus the first filament segment. The lateral ocelli are almost as far apart as they are from the eyes. The first filament segment is about as long as the second plus one-third of the third.

Scutellum with a longitudinal impress in the middle. Dorsum of the median segment finely leathery. Petiole somewhat longer than the second hind tarsal segment, and therefore long, as compared with many other species. The ventral anal plate is slightly ploughshare shaped and pointed, more than in *umbrosus* Chr. The upper anal plate with a strong curve. Structure of the genital apparatus illustrated as figure 34 of plate V; it most closely resembles that of *Sph. incomptus* Gerst. (Kohl, 1895.)

Some writers seem to regard *tinctipennis* Cameron as a variety or subspecies of *brasilianum* rather than as the same. As I have not seen either I do not feel competent to express any opinion on the point. *C. brasilianum* as such has not been reported from any localities within the limits of this paper, but *tinctipennis* has been taken in Costa Rica and Guatamala (El Tumbador, 2,500 feet). Kohl does not recognize any variety of *brasilianum* and places *tinctipennis* in the synonomy; accordingly the description above should be satisfactory for the latter.

CHLORION (PROTEROSPHEX) TEXANUM (Cresson).

Sphex texana Cresson, Trans. Am. Ent. Soc., IV, 1872, p. 212.
Sphex texanus Kohl, Ann. natur. Hofmus. Wien, V, 1890, p. 427.

Type.—"Five male and female specimens. (Belfrage; Boll.)" In the collection of the American Entomological Society, in Philadelphia, are about a dozen specimens of this insect from Texas, one bearing Cresson's label, and which therefore must be regarded as one of the types. In the National Museum are two females and a male labeled "Texas Belfrage," "Type No. 1688 U.S.N.M." In the collection at Harvard College are two females marked "Dallas Tex. Boll Type." Some one of these six must be a metatype or a homotype, but all are correctly identified at least.

Rather slender insects; body black, except the abdomen, which may be partly ferruginous; wings hyaline, slightly fuliginous on the outer margins; pubescence pale golden to silvery.

Female.—Head broad, quadrangular, the cheeks being quite broad; clypeus somewhat arched laterally, it and the frons thickly covered with pale golden to silvery pubescence to a point above the antennæ, and nearly to the ocelli in some cases, with long hairs of the same color; the pubescence is less thick on the middle and anterior margin of the clypeus, which is black, very minutely punctured, and also with coarse punctures; anterior margin of the clypeus evenly rounded, not noticeably reflexed, with a short, median, truncated projection, often concealed by the pubescence; portion of the frons not covered by pubescence minutely, sparsely punctured, sericeous; lateral ocelli nearer the eyes than each other; vertex and cheeks punctured like the frons; gray sericeous, the occiput and cheeks behind with a few pale hairs, longer on the lower part of the cheeks, which are three-fourths as wide as the eyes; inner margins of the eyes slightly converging toward the clypeus; antennæ black, the scape and pedicel with a dark ferruginous tinge; the scape with numerous short, yellowish hairs on its inner face, and a narrow, sericeous band in some cases; filament yellowish-gray, sericeous, its first segment longest; mandible black, with a ferruginous tinge from the base to the base of the teeth; with scattered aciculations on the anterior face, a few yellowish hairs on the inner edge, and a fringe of similar hairs on the lower edge of the posterior face; when closed, the tip of a mandible reaches beyond the base of the other.

Thorax.—Collar pale sericeous, its dorsal edge yellowish-silvery pubescent, the edge being slightly flattened in the middle; anterior surface nearly vertical, with scattered, long, pale hairs; posterior face not closely appressed against the mesonotum; prothoracic lobe black, its posterior half covered with pale golden to silvery pubescence, mingled with long, silvery hairs; mesonotum with a more

or less developed silvery pubescent band on each side, extending from in front of the tegula backward to the end of the plate, then inward toward the band of the other side, which it usually does not quite meet; median anterior groove very slight; surface of the mesonotum elsewhere sericeous, with very minute punctures, and scattered, coarser ones; scutellum black, sericeous in certain lights, with a few small, scattered punctures, and a very slight median groove; postscutellum silvery pubescent, with a median groove, the pubescence extending to the lateral edge of the dorsum of the median segment; dorsum of the median segment sericeous, with a slight, longitudinal, elongate-oval depression in front of the fovea; posterior end of the segment with two spots of dense, silvery pubescence, confluent at the middle and extending part way around the petiolar articulation; between these spots and the stigmatal groove the surface is black, with short, transverse aciculations near the dorsum; entire surface of the median segment quite thickly clothed with pale hairs, longest behind; surface of the dorsum dull black, minutely roughened; mesopleuron with a pale pubescent spot just behind the prothoracic lobe; the rest of the plate black, quite smooth or very minutely punctured, and with many very short, erect, pale hairs; there is a very faint pubescent spot in front of and above the mesocoxa and a well-developed pubescent band running upward from the hind coxa along the stigmatal groove to the stigma and in some cases showing a little behind the groove; aside from these pubescent areas the surface of the metapleuron is black, quite smooth, and sparsely covered with short hairs; petiole short, black, sericeous, bearing numerous whitish hairs.

Abdomen.—Elongate-oval, longer than the thorax, about equally pointed at both ends; sericeous above, particularly on the anterior half; the first and most of the second dorsal plates dull ferruginous, the amount of ferruginous varying in different specimens; remaining plates black or varied more or less with ferruginous; last two dorsal plates rather coarsely punctured, the punctures coarser and closer on the last, both plates bearing scattered brown hairs; beneath rather glistening, bearing a few scattered hairs on each plate, rather more abundant posteriorly; apparently extremely closely and minutely punctured, and with a few more pronounced, scattered punctures, which are most numerous posteriorly; dorsal and ventral terminal plates rather narrowly rounded behind.

Wings.—Hyaline, rather fuliginous on the outer margin, this being strongest on the fore wing and just beyond the end of the radial cell; first recurrent vein of the fore wing almost interstitial with the second transverse cubital vein; transverse median vein of the hind wing slightly arched, making rather more than a right angle with the median; discoidal vein not interstitial; cubital vein with a slight backward bend

near its middle, nearly or quite obsolete beyond the transverse cubital, these two meeting very sharply; cubital and subdiscoidal veins of the fore wing nearly or entirely obsolete beyond the ends of the cells; third cubital cell with almost no margin on the radial cell, the second and third transverse cubital veins almost meeting there; tegulæ finely, sparsely punctured, blackish to more or less ferruginous.

Legs.—Black or very dark brown; anterior coxæ sericeous in front, the middle and hinder ones only faintly so; hind coxæ silvery pubescent behind; coxæ and trochanters with short hairs, most abundant on the fore legs; fore femora quite hairy beneath and with a trace of a silvery pubescent line in some cases; all the femora with a few small, scattered punctures; tibiæ and tarsi sericeous, the hind tibiæ densely so behind; fore metatarsus with ten short comb teeth, the first shorter than the others; tarsi rather lighter than the other leg segments, their claws ferruginous except the tips, which are black.

Male.—Differs from the female as follows: Abdomen more sericeous above; cheeks about half the width of the eye; posterior half of the last dorsal abdominal plate closely covered with short, brown hairs pointing backward; the posterior margin of this plate evenly rounded at the sides and with a shallow notch in the center; seventh ventral plate quite excavate behind, with a fringe of yellowish hairs along its outside edge; terminal ventral plate rather narrow, with a median ridge, its posterior margin rounded at the sides, with a somewhat acuminate median projection; the abdomen as a whole black, but with a slight ferruginous tinge above at the base and on the first two or three segments beneath; tegulæ variously mottled with black and dark ferruginous.

In some specimens the first recurrent vein of the fore wing is not nearly interstitial with the second transverse cubital and the amount of ferruginous on the abdomen of the male is quite variable.

Length.—Females, 21–24 mm.; males, 21–23 mm.

This pretty species appears to be quite common but local in its distribution, as all the specimens I have seen were captured in Texas. The only closer data are for two examples taken at Dallas. Cresson says it is a common species taken on Solidago flowers in September and October.

It is pictured in the Insect Book on Plate XI, figs. 3 and 6 (the latter being named *tenanus* by a misprint).

UNIDENTIFIED SPECIES.

I am unable to recognize the following species, which have been described as having been taken within the geographical limits covered in this paper, though I have in some cases ventured to guess at what they may be. The name given is that under which the description was published.

SPHEX ARGENTATA Dahlbom.

Smith[a] records this insect from Greece, India, Java, Africa, and from St. Johns Bluff, Florida. It is a well-known Old World species, and as no other record of its capture in America exists it is probably an erroneous record and may safely be omitted from the American faunal lists.

SPHEX AURULENTA Fabricius.

The only authority for this species as American is the locality "Am. bor." in Dalla Torre's Catalogus Hymenopterorum, and as there seems to be no other record of it from this country, while it is well known from India and China, I must consider this as an error and regard it as not an American insect.

SPHEX CRŒSUS Lepeletier.

Sphex crœsus LEPELETIER, Hist. Nat. Ins. Hym., III, 1845, p. 351.

This insect was described from "Amerique Septentrionale. Montagnes rocheuses." Dalla Torre suggests that it may be a variety of *C. ichneumoneum*, and this may be correct.

SPHEX DIMIDIATA De Geer.

Sphex dimidiata DE GEER, Mem. Hist. Nat. Ins., III, 1773, p. 589, pl. xxx, fig. 5.

This species, which was from Pennsylvania, is compared with a *Sceliphron*, and it may also be one of that genus. The figure is of no assistance.

SPHEX DIMIDIATA Lepeletier.

Sphex dimidiata LEPELETIER, Hist. Nat. Ins. Hym., III, 1845, p. 352.

From "Amerique Septentrionale." It may possibly be a fuliginous winged *C. ichneumoneum*.

SPHEX DORSALIS Lepeletier.

Sphex dorsalis LEPELETIER, Hist. Nat. Ins. Hym., III, 1845, p. 347.

Lepeletier's description was prepared from a male taken at Cayenne. It is possible that it is a specimen of *C. spiniger*, with considerable ferruginous on the abdomen, but no certainty seems possible.

SPHEX EXCISUS Kohl.

Sphex excisus KOHL, Ann. natur. Hofmus. Wien, V, 1890, p. 362.

I am unable to separate this species by the description from *C. bifoveolatum* Taschenberg, as the differences are mainly those of relative lengths of different parts, and some specimens I have examined agree

[a] Cat. Hym. Brit. Mus., IV, 1856, p. 252.

with *excisus* in some of these measurements and with *bifoveolatum* in others. As it is very possible that I have not seen this species I place it here.

SPHEX INSTABILIS Smith.

Sphex instabilis SMITH, Cat. Hym. Brit. Mus., IV, 1856, p. 263.

This description is suggestive of an *Isodontia* in some regards, and I have wondered if it could be *C. exornatum*. The locality given is "North America."

SPHEX MIXTA Fabricius.

Sphex mixta FABRICIUS, Ent. Syst., IV, 1794, p. 457.

SPHEX NEOXENUS Kohl.

Sphex neoxenus KOHL, Ann. natur. Hofmus. Wien, V, 1890, p. 363.

Kohl expresses doubt as to the correctness of the locality given on his specimen of this insect (Vancouver Island), as it looks to him more like a South American form. In a collection of *Sphecidæ* from Argentina, which I have had the opportunity to study, are specimens which come nearer this species than any other, differing from it mainly in the amount and distribution of the color. I am therefore inclined to indorse Kohl's opinion and regard this as a South American species.

SPHEX OPACA Dahlbom.

Sphex opaca DAHLBOM, Hym. Eur., I, 1845, p. 437.

This may possibly be *C. flavitarsis*. It is from "Americ. merid."

SPHEX PETIOLATA Drury.

Sphex petiolata DRURY, Ill. Nat. Hist., II, 1773, p. 75, pl. XXXIX, fig. 7.

From Jamaica. Apparently a *Sceliphron*.

SPHEX SINGULARIS Smith.

Sphex singularis SMITH, Cat. Hym. Brit. Mus., IV, 1856, p. 261.

It is possible that an examination of the type of this species would show it to be the same as *C. spiniger*, though this can not be demonstrated from the description. It is from Honduras.

SPHEX SINGULARIS Cameron.

Sphex singularis CAMERON, Biol. Centr.-Amer. Hym., II, 1889, p. 33, pl. III, figs. 7, 7a.

From Mexico, Guatemala, Honduras, and Panama. Is it the same as the last?

PEPSIS T Palisot Beauvais.

Pepsis T PALISOT BEAUVAIS, Ins. rec. en Afr. and Amer., Hym., 1805, p. 117.
Sphex T SMITH, Cat. Hym. Brit. Mus., IV, 1856, p. 260.

Apparently a *Sceliphron*. The name was given because of a T-shaped mark on the back of the thorax, and none of the insects I have seen has such a mark.

The locality given is Santo Domingo.

SPHEX VAGA Christ.

Sphex vaga CHRIST, Natur. d. Ins., 1791, p. 305.

SPHEX VIOLACEIPENNIS Lepeletier.

Sphex violaceipennis LEPELETIER, Hist. Nat. Ins. Hym., III, 1845, p. 349.

Described from "Philadelphia." It may prove to be *C. (Palmodes) abdominalis* Cresson.

INDEX TO GENERAL SUBJECTS AND STRUCTURAL TERMS.

INDEX TO NAMES.

Names of groups are in small capitals; generic names begin with a capital; specific names are in small type, and synonyms and preoccupied names are in italics. References to descriptions are in heavy type.

EXPLANATION OF PLATES.

The figures on the following plates were prepared by tracing from photographs as is shown in some cases by a lack of bilateral symmetry due to the angle at which the photograph was taken. In this way accuracy of outline and in the relation and proportion of the parts was assured, while at the same time other and non-essential features could be omitted, giving the figures the character of diagrams.

The plates are by the author.

Plate VI.

Fig. 1. Side view of the body of *Chlorion* (*Proterosphex*) *ichneumoneum*.

a, prothorax.
*a*1, neck.
*a*2, collar.
*a*3, prothoracic lobe.
ac, anterior coxa.
b, mesothorax.
*b*1, mesonotum.
*b*2, scutellum.
*b*3, mesothoracic episternum.
*b*4, episternal groove.
*b*5, mesothoracic epimeron.
c, metathorax.
*c*1, postscutellum.
*c*2, metapleuron.
*c*3, metathoracic epimeron.
*c*4, metapleural lobe.
d, median segment.
*d*1, dorsum.
*d*2, end.
*d*3, side.
*d*4, stigma.
*d*5, fovea.
*d*6, stigmatal groove.
f, funiculus.
fw, fore wing.
hw, hind wing.
l, lobe.
mc, mesocoxa.
p, petiole.
pc, posterior coxa.
s, stigma.
st, sting.
t, tegula.
1–6, abdominal plates.

Fig. 2. Dorsal aspect of the thorax of *Chlorion* (*Chlorion*) *cyaneum*. The median impressed lines on the mesonotum have been somewhat increased to show their appearance in other subgenera. Lettering as in fig. 1.

3. Hind tibia of *Chlorion* (*Proterosphex*) *cubensis*, showing the apical enlargement on the inner side.

4. Hind tibia of *Chlorion* (*Proterosphex*) *lautum*, showing the curved inner contour of the piece.

5. Hind tibial comb spine of *Chlorion* (*Proterosphex*) *ichneumoneum*, showing its fringe of hairs on the inner side.

6. Hind tibial comb spine of *Chlorion* (*Priononyx*) *atratum*, showing the teeth on the inner side.

PLATE VII.

Fig. 7. Fore and hind wings of *Chlorion* (*Proterosphex*) *ichneumoneum*, with the veins named according to the usual nomenclature.

a, anal.
am, apical margin.
ax, axillary.
b, basal.
c, costal.
cu, cubital.
d, discoidal.
f, fold.
ff, frenal fold.
fh, frenal hooks.
m, median.
pm, posterior margin.
r, radial.
*re*1, first recurrent.
*re*2, second recurrent.
s, stigma.
sc, subcostal.
sd, subdiscoidal.
si, sinus.
tc, transverse cubital.
*tc*1, first transverse cubital.
*tc*2, second transverse cubital.
*tc*3, third transverse cubital.
tm, transverse median.

Fig. 8. The same wings with the veins named according to the nomenclature of Comstock and Needham.

PLATE VIII.

Fig. 9. The same wings with the cells named according to the usual nomenclature.

a, anal.
*ap*1, first apical.
*ap*2, second apical.
c, costal.
cu, cubital.
*cu*1, first cubital.
*cu*2, second cubital.
*cu*3, third cubital.
*cu*4, fourth cubital.
*d*1, first discoidal.
*d*2, second discoidal.
*d*3, third discoidal.
m, median.
r, radial.
sm, submedian.

Fig. 10. The same wings with the cells named according to the nomenclature of Comstock and Needham.

11. Outline of the posterior margin of the sixth ventral abdominal plate of *Chlorion* (*Priononyx*) *biforcolatum*, male, showing the median excision.

12. Antenna of *Chlorion* (*Proterosphex*) *ichneumoneum*.

b, bulb.
fil, filament.
p, pedicel.
s, scape.

PLATE IX.

Fig. 13. Wings of *Chlorion* (*Chlorion*) *cyaneum*.
14. Wings of *Chlorion* (*Palmodes*) *læviventris*.
15. Wings of *Chlorion* (*Priononyx*) *atratum*.
16. Wings of *Chlorion* (*Priononyx*) *ferrugineum*.
17. Wings of *Chlorion* (*Isodontia*) *harrisi*.
18. Claw of *Chlorion* (*Proterosphex*) *ichneumoneum*.
19. Claw of *Chlorion* (*Priononyx*) *striatum*.
20. Claw of *Chlorion* (*Priononyx*) *ferrugineum*.
21. Fore tibial comb of *Chlorion* (*Proterosphex*) *ichneumoneum*.

PLATE X.

Fig. 22. Face of *Chlorion* (*Chlorion*) *cyaneum*.
23. Face of *Chlorion* (*Palmodes*) *læviventris*.
24. Face of *Chlorion* (*Priononyx*) *atratum*.
25. Face of *Chlorion* (*Proterosphex*) *ichneumoneum*.
26. Face of *Chlorion* (*Isodontia*) *auripes*.
27. Fore metatarsal comb of *Chlorion* (*Priononyx*) *ferrugineum*.